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A case-control study on environmental and familial risk factors for colorectal cancer in Hong Kong: dietary determinants of colorectal cancer risk

Key Messages

1. The public should be educated on the importance of healthy eating and cooking habits as a means to prevent colorectal cancer. These include:
 - a. A diet high in fruit and vegetables and low in fat and salt;
 - b. Reduce cooking red meat by grilling or barbecuing and limit the use of cooking oil.
2. Advice from a dietician should be obtained in designing healthy and yet appetising recipes to be promoted and incorporated in school meals and home cooking.
3. A food-labelling policy should be enforced to inform consumers about the levels of important nutrients in the various food products.

Introduction

Epidemiological studies in western countries show dietary habits to be a major factor in colorectal cancer. Three previous studies on different Chinese populations yielded conflicting results regarding the association of fat, meat, fibre, fruit, and vegetables with colorectal cancer.¹⁻³ In Hong Kong, it is uncertain which dietary component plays a major role in colorectal carcinogenesis: is the Hong Kong dietary pattern unique or does it follow that seen in other Chinese populations or western countries? This report describes the result of a hospital-based case-control study conducted in three Hospital Authority hospitals from April 1998 to March 2000.

Methods

Among the 1120 and 970 subjects identified for the case and control groups, 822 cases and 926 controls, respectively, were recruited and interviewed. Information on dietary and cooking habits as well as nutrient intake 2 years prior to interview were obtained by structured interview using a validated questionnaire adapted from the Hong Kong Adult Dietary Survey.⁴ Multivariate analysis was performed for significant factors identified on univariate analysis with adjustment for possible confounders including demographic features (sex, age, marital status, education level), familial (family history of colorectal cancer), and environmental (smoking and drinking habits, physical activity level and analgesia intake) risk factors. For dietary and cooking habits, adjustment was also made for nutrient intake.

Results

Dietary risk factors

Individuals who routinely add salt to dishes at the table even before tasting had a significantly increased risk of colorectal cancer compared with those who never/rarely add salt (OR_{adjusted}=2.20; 95% CI, 1.43-3.41). Increasing frequency of adding salt at the table increased the risk in a dose-response manner (P trend 0.005). The association remained significant for the subsites of colon and rectal cancer.

Compared with subjects reported to have low oil consumption, those with high oil consumption had a significantly increased colorectal cancer risk. In addition, the risk increased with increasing quantity of oil consumed in a dose-response manner. The significant association remained for the subsite of rectal cancer as well as after adjustment for confounders (P trend: colorectal cancers=0.038; rectal cancers=0.013) [Fig 1].

Among the various cooking methods assessed, grilling or barbecuing red meat was most consistently associated with increased colorectal cancer risk (OR_{adjusted}=1.63; 95% CI, 1.31-2.03) [Table]. Heterocyclic amines found on charred materials produced by the grilling process have been shown to be carcinogenic for the colonic mucosa.

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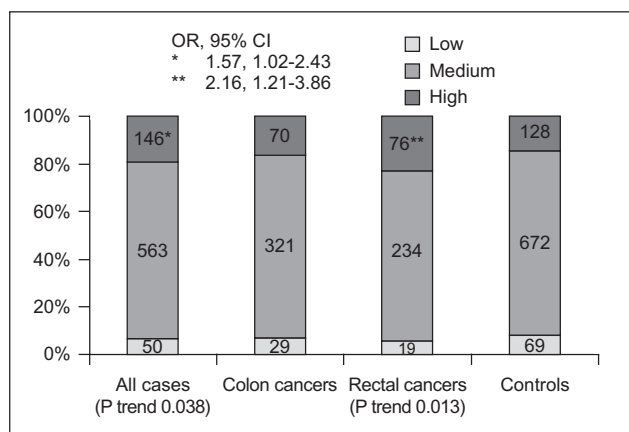


Fig 1. Amount of oil consumption and colorectal cancer risk

Eating dessert at least once a week was associated with colon cancer risk on subsite analysis ($OR_{adjusted}=2.0$; 95% CI, 1.31-3.04). However, no such association was found for the whole group or for the rectal cancer subsite.

Dietary protective factors

The mean weekly frequency of fruit intake was significantly lower in cases than controls (5.99 ± 4.55 vs 7.30 ± 5.41 , $P < 0.001$). Increasing tertile for the weekly frequency of fruit intake was associated with progressively reduced colon and rectal cancer risk in a dose-response manner (P trend: colon cancers=0.002; rectal cancers=0.012) [Fig 2].

Compared with those who did not trim any fat from meat, individuals who trimmed some or all fat from meat before eating had significantly reduced colorectal cancer risk and rectal cancer risk. Subjects who ever drank Chinese green tea had a significantly reduced risk of colon cancers before and after adjustment for potential confounders ($OR_{adjusted}=0.69$; 95% CI, 0.48-0.998). However, the frequency and the amount of green tea consumed were not associated with cancer risk. There was also no association between drinking other types of Chinese tea and colorectal cancer.

Table. Grilling red meat and colorectal cancer risk

	All cases	Colon cancers	Rectal cancers	Controls
Grilling red meat				
No	347	196	144	511
Yes	409	226	179	365
Adjusted OR (95% CI)	1.63 (1.31-2.03)	1.7 (1.30-2.21)	1.68 (1.26-2.23)	

Association of daily nutrient and food group intake with colorectal cancer risk

Upon univariate analysis, the following micronutrients were found to be associated with reduced colorectal cancer risk: vitamin A, vitamin B1, vitamin B2, vitamin C, calcium, phosphate, iron, zinc, copper, and crude fibres. Increasing tertiles for the daily intake of these nutrients resulted in progressively reduced cancer risk. During subsite analysis, vitamin A, vitamin C, calcium, and crude fibres were associated with reduced risk of both colon and rectal cancers. However, intakes of the remaining micronutrients were only associated with reduced risk for colon cancer.

Among the various food groups studied, daily intake of all vegetables, cruciferous vegetables and fruit were associated with reduced risk of both colon and rectal cancers on univariate analysis. For each of these three types of food, the risk reduced progressively with increasing tertiles of daily intake.

On multivariate analysis, vitamin C and copper were found to be independent protective nutrients against colorectal cancer. For colon cancer, the significant nutrients were crude fibres and copper whereas vitamin C was an independent protective agent against rectal cancer.

Conclusions

Fruit and vegetables with their high fibre and antioxidant vitamin content were protective against both colon and

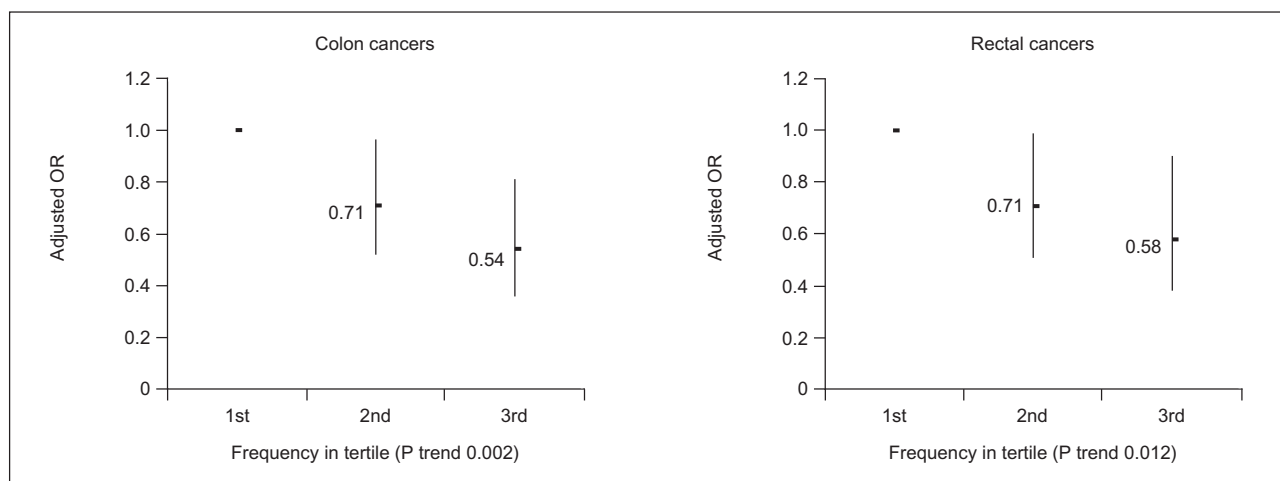


Fig 2. Adjusted colon and rectal cancer risk with tertile of weekly fruit intake

rectal cancer. Their important components, namely, crude fibres and vitamin C were independent protective nutrients against colon and rectal cancer, respectively. Copper, an antioxidant mineral, was also an independent protective nutrient against colon cancer. Eating habits resulting in high fat intake, including eating fat attached to meat and high oil consumption with meals, were associated with colorectal cancer, particularly rectal cancer. Other hazardous dietary habits for both colon and rectal cancers include: grilling or barbecuing red meat, and the routine addition of salt to food at the table.

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