# A study on relation of dietary fiber from different sources, acceptable daily intake of calcium and colorectal cancer of 30 to 45 years old

**Dongjie Wang*, Yan An, Huifang Zhu and Libin Yang**
Langfang Health Vocational College, Langfang, 065001, Hebei, China

**Abstract**: This paper selects Jiashan, Zhejiang, the high incidence area of colorectal cancer in China, as research site and adopts case control as research method to study relative hazards of colorectal cancer, especially the relation between dietary factor and colorectal cancer. It makes a further understanding of the possible cause of high incidence of colorectal cancer in Jiashan in order to provide a scientific basis for the prevention of colorectal cancer.

**Keywords**: Colorectal cancer, female, dietary fiber.

## INTRODUCTOIN

Colorectal cancer is consisting of cancer of colon and carcinoma of rectum, which is one of the most common cancers. Incidence of colorectal cancer takes the third place in the world and the second place in economically developed countries. For example, there were more than 370 million new cases in 2002 and 200 0million of them died, which account for the 120% of all cancer in European. In developing countries, incidence rate is relatively low. In China, incidence rate of colorectal cancer is in the fifth place. However, with the development of economic, improvement of living standard and change of living style, growth rate of colorectal cancer is so fast especially in some metropolis. For instance, colorectal cancer up to the fourth place in 1980's from the sixth in 1970's in Shanghai. And in 1990's it took the third place. In addition, it was learned from the 2th international colorectal cancer summit forum in Shanghai that incidence of colorectal cancer in shanghai is 40.8/1 million, more than 3000 are the new cases and colorectal cancer has become the second high incidence of tumor after lung cancer.

High incidence area is 25 times of low incidence area, which indicate that there is a large discrepancy of colorectal cancer in different area (Yang *et al.*, 2009). The obvious discrepancy due to the different environmental exposure factor in different areas. Environmental exposure factor account for 70% of attributable risk of colorectal cancer (Guanyu, 2009 and Bo, 2009). The common environmental exposure is consist of unhealthy living style as smoking and drinking ardent spirits, unreasonable dietary habit and dietary structure as high fat, low dietary fiber and less vegetables and diseases history, among which dietary factor play a big effect on colorectal cancer.

It was reported that 50% colorectal cancer is casual connected with dietary factor. So far, although there is controversial that whether the incidence of colorectal cancer is casual connected with some food, nutrient and specific compound, it is acknowledged that the high intake of protein and animal fat, low intake of dietary fiber is the main hazards of colorectal cancer, especially the cancer of colon. Other nutrient in diet is consisting of vitamin A, C, E, D and calcium and selenium is protective factor. In addition, the relation of cancer and B vitamins that is related to one carbon unit metabolism draws more and more attention.

**Corresponding author:* e-mail: wdj7526@163.com

## MATERIALS AND METHOD

### *Study object*

Study object was 148 cases of age from 30 to 45 colorectal cancer patients that was received and cured by our hospital from January, 2010 to January, 2014 and the average age of them was 40.4±5.2. And course of disease is 2 to 12 month and the average was6.7±3.1 month. Among them, 78 cases were patients with cancer of colon and 70 cases were patients with carcinoma of rectum. Take above object as observation group and random selecting 148 cases of 30 to 45 years old female among people who attend physical examination in hospital as control group (Huacheng, 2005).

### *Selection of cases*

The cancer registry system in cancer prevention institution in Jiashan established special intestinal cancer insurance card system for colorectal cancer. It makes a detailed registration of basic information, diagnose information and death information of annual new incident colorectal cases but level three cancer prevention network. The cases come from repot card female patients in cancer prevention institution in Jiashan. Select 148 survival cases of primary colorectal cancer (93 cases of cancer of colon and 114 cases of carcinoma of rectum) that happened from January, 2010 to January, 2014 and once attended 2010 to 2014 colorectal cancer general investigation to form case group. More than 70% were diagnosed after 1997 and age from 30 to 45 years old.

100% cases were diagnosed by pathology, operation or endoscope (Yang Yuexin, 2004). Rectal carcinoid, metastatic colorectal cancer or the colorectal cancer that is detected in screening from 2010 to 2014 were excluded from this research.

***Selection of control***

Age of the group in cervical cancer census register in 2010 can be divided into five groups: 30 to 35, 35 to 40 and 40 to 45. Select contrast by stratified sampling according to the age division and gender. The specific practice is that ranks the census number from low to high and random select a certain number of controls in 64693 numbers by random sampling tools of Excel. Every control select 5 candidate control (Marjorie *et al.*, 2007) in order to prevent loss of sample size because of death and removal of research object, that is, find out the relevant research object according to the census number in census register of 2010. Then find 5 people from same village with same gender and age±5. Number them as candidate 1, candidate 2, candidate 3, candidate 4 and candidate 5. If the contrast is loss to follow up, then investigate candidate 1. If candidate 1 is loss to follow up, then investigate candidate 2 and so on. If 5 candidates are all not investigated, then they are loss to follow up (Parkin *et al.*, 2001).

Response rate of the investigated 343 cases in 2010 is 89.56%. 504 people were investigated in 2014 in order to augment sample size and the response rate is 91.64%. Total contrast was 847 people (Xin *et al.*, 1998). Extract 414 people as control group, 2 times of case sampling size by random sampling in 847 controls (Parkin *et al.*, 2001).

***Investigating content and method***

*Investigating content*

After the research object was informed consent and signed informed consent form, adopt household interview to ask general condition such as name, birth date, marriage, job and educational level, living condition, style and habit such as activity, drinking water type, hobby of cigarettes and wine, history of tea drinking, dietary habit such as whether like to eat salted product, fat and whether like to eat hot food, dessert, salty food, hard food, consumption frequency and consumption amount of 60 kinds of food such as meat, seafood, egg, beans, vegetables and fruits, history of disease such as intestinal polyps, schistosomiasis, knot proctitis, biliary tract disease, family history of disease, family history of cancer, female menstrual history of fertility, mental factor such as easy to get angry, self-adjust ability and phycological condition, informed census of informant and investigators postscript (Xin *et al.*, 1998). Know the intake amount of various foods by asking single consumption and frequency. Some foods were adjusted seasonally (Slattery, 2000).

***Investigating method***

Fill out unified formulating and pre-survey questionary after the investigators who were trained to be qualified asked the investigators directly. In order to help the investigation object recall to improve the accuracy of dietary survey, this investigation adopt the method of showing food models , which was consist of 5 models, such as meat stand for meat product, fish stand for fish product, bags of green beans stand for vegetables and fruits, bowl model and cup. In addition, we request the cases to answer the dietary condition that is one year before definite diagnosis. Contrast answer is determined according to the changes of eating habits in nearly five years. If there is no change, then ask the dietary habit of 2010. Otherwise, ask the dietary habit one year before change (Park, 2005).

***Quality control***

Before investigation, all the investigators should be trained. Unified their understanding of questionary and standard of filling questionary. Every investigator at spot investigation were equipped with investigator notebook as a unified standard test. There were specialized quality control people to do a logical check of the questionary that is recycled that day. Return the inaccurate questionary to the investigators to reinvestigate. After the investigation, random select 5% questionary from cases and control group to make a phone revisit to test the reliability of these investigation materials.

***Organization and analysis of materials***

*Calculation of nutrient*

The formula of calculating nutrient in 100 g of food is: X=A*EP/100. A is the content of nutrient in 100 g of edible part. EP is the amount of edible in 100g of food. EP value of all kinds of foods and X value of the nutrients and energy, including dietary fiber, fats, protein, vitamin A, C, E and $B_2$, $B_6$, $B_{12}$ and folic acid that is related to the metabolism of one carbon unit were quoted from the reports of Chinese food ingredients list 2002 and Chinese food ingredients list 2004. And it make a seasonal adjust to some seasonal food. Establish food ingredients database by Microsoft Excel 2003 software. Nutrient and energy intake amount of every research object should be calculated by statistical software SPSS13.0forwind, s.

## STATISTIC ANALYSIS

Two groups of people input the data by EPidata2003 software after unifying coding of questionary. Input twice and then proofread by command of VALIDATE DUPLICAT FILES. Establish database after confirmed. Do variable substitution and coding before analysis and make a statistically analysis according to cancer of colon and carcinoma of the rectum. Make single factor analysis of all research factors, a normality analysis of continuous variable such as age, drinking age, smoking age, intake

**Table 1**: Balance test of demography and the relation between it and colorectal cancer

| Demography condition | | Contrast | Colon cancer | | Carcinoma of the rectum | |
|---|---|---|---|---|---|---|
| | | Cases | Cases | Statistics | Cases | Statistics |
| | | 414(62.0±10.0) | 92(63.7±8.6) | $1.975^{a*}$ | 113(62.0±10.0) | $0.268^{a}$ |
| Age and gender | Male | 214 | 48 | $0.000^{b}$ | 57 | $0.102^{b}$ |
| | Female | 200 | 45 | | 57 | |
| Marital status | Married | 356 | 80 | $0.000^{b}$ | 93 | $1.367^{b}$ |
| | Other | 58 | 13 | | 21 | |
| Job | Farmer | 317 | 60 | $5.787^{b}$ | 85 | $0.198^{b}$ |
| | Other | 97 | 33 | | 29 | |
| Educational level | Illiteracy | 205 | 39 | | 61 | |
| | Primary school | 125 | 30 | $1.578^{b}$ | 34 | $0.982^{b}$ |
| | Junior high school | 59 | 13 | | 16 | |
| | Middle school | 25 | 11 | | 3 | |

**Table 2**: Relation of history of disease and colorectal cancer

| History of disease | | Contrast | Colon cancer | | Carcinoma of the rectum | |
|---|---|---|---|---|---|---|
| | | Cases | Cases | $x^2$ | Cases | $x^2$ |
| | No | 353 | 73 | 2.139 | 103 | 1.824 |
| | Yes | 60 | 19 | | 11 | |
| | No | 406 | 89 | 0.951 | 109 | 2.908 |
| | Yes | 7 | 3 | | 5 | |
| | No | 363 | 81 | 0.081 | 105 | 1.511 |
| | Yes | 45 | 9 | | 8 | |
| | No | 387 | 86 | 0.076 | 106 | 0.008 |
| | Yes | 21 | 4 | | 6 | |
| | No | 389 | 75 | $19.150^{*}$ | 91 | $26.199^{*}$ |
| | Yes | 2 | 6 | | 9 | |
| | No | 390 | 79 | $7.032^{*}$ | 102 | $7.553^{*}$ |
| | Yes | 12 | 8 | | 10 | |
| | No | 203 | 20 | $23.292^{*}$ | 29 | $20.226^{*}$ |
| | Yes | 208 | 72 | | 84 | |

Notes: *P<0.01

**Table 3**: Relation of drinking and colorectal cancer

| Living habit | | Contrast | Colon cancer | | Carcinoma of the rectum | |
|---|---|---|---|---|---|---|
| | | Cases | Cases | Test value | Cases | Test value |
| History of drinking | No | 287 | 65 | $0.035^{b}$ | 82 | $0.359^{b}$ |
| | Yes | 125 | 27 | | 31 | |
| Types of drinking | Bear | 9 | 4 | $1.375^{b}$ | 3 | $0.084^{b}$ |
| | Moderate wine | 100 | 17 | $1.477^{b}$ | 25 | $0.245^{b}$ |
| | Ardent spirits | 33 | 14 | $4.529^{b*}$ | 12 | $0.749^{b}$ |
| Drinking age | 117 | 28 | 28 | $1.965^{a*}$ | 32 | $0.352^{a}$ |
| | | | | | | |

Notes: a is nonparametric value Z, b is value $X^2$*P<0.05

amount of dietary category and intake amount of dietary nutrient. Make a t test of normality continuous variable and nonparametric analysis of non-normality continuous variable and dietary habit. And make a chi-square test of nongraded variable such as gender, job, history of disease, type of drinking and type of cigarette and select the relative factor that affect colorectal cancer. Establish classification tree model figure with the help of SPSS19.0 statistical software by Chi-squared Automatic Interaction Detecto. Do logarithmic transformation and normality test of the non-normality distributed variable in the research factor and take it as object variable after meeting the request. Modeling parameter Settings are as follows: Maximum of tree deep in colon cancer classification tree

model is 5, minimum case number of mother node is 50 and minimum case number of child modes is 10. Maximum of tree deep in carcinoma of the rectum is 5. Minimum case number of mother node is 50 and minimum case number of child modes is 15. Make a stratification analysis of relation between classification tree model figure and colorectal cancer that is statistically significant ($p<0.05$).

Put the variable whose significance level was lower than 0.05 in single factor analysis and CHAID method. Fitting the multi-factor unconditional Logistic regression model of colon cancer and carcinoma of the rectum by stepwise regression method. Remove the variable whose significance level is higher than 0.10 in the model. And above data processing can use SPSS19.0 statistical analysis software.

## RESULT

***Analysis result of single factor***

*Demography condition*

Make a balance test on age and gender and the result was showed in table 1. It can be seen from table 1 that the average age of colorectal cancer was 63.7 and 62.0 and that of control group was 62.0. There was a significant difference ($z=1.975$, $p<0.05$) between colorectal cancer group and control group on age while the difference of carcinoma of the rectum was not significant. Balance of gender, marital status and educational level in colorectal cancer patients was good. Risk of colon cancer between farmers and people from other profession was significant different ($X^2=5.787$, $p<0.05$) while risk of carcinoma of the rectum was not statistically significant different ($X^2=0.198$, $p>0.05$).

***History of disease and colorectal cancer***

Single factor analysis of history of disease and colorectal cancer is showed in table 2. Colon cancer and intestinal polyp ($X^2=19.150$, $p<0.01$), perianal cyst ($X^2=7.032$, $p<0.01$) and bilharziasis ($X^2=23.292$, $p<0.01$) had significant relationships. And carcinoma of the rectum and intestinal polyp ($X^2=26.199$, $p<0.01$), perianal cyst ($X^2=7.553$, $p<0.01$) and bilharziasis（$X^2=20.226$, $p<0.01$) had significant relationship as well. This research did not find that there was no statistical significant between colorectal cancer and high blood pressure, diabetes and gastritis.

***History of drinking and colorectal cancer***

It can be seen from table 3 that colon cancer and drinking ardent spirits were statistically significant ($X^2=4.529$, $p<0.05$) and relation between colorectal cancer and drinking age was statistically different ($Z=1.965$, $p<0.05$).

***History of smoking and colorectal cancer***

It can be found in table 4 that there had a statistical relation between involuntary smokers in non-smokers. ($X^2= 4.581$, $p<0.05$; $X^2=4.844$, $p<0.05$)

## DISCUSSION

***Demography Factor and Colorectal Cancer***

It was reported that age is closely related to the incidence of colorectal cancer. American cancer association summary thought that the incidence rate of colorectal cancer and death rate was increasing with age. The incidence and death rate account for 91% and 94 % after 50 years old. This research only showed age was related to colon cancer in single factor analysis and age was not statistically related to carcinoma of the rectum. Studies found that lack of physical activity have obvious relationship with the incidence of colon cancer but the relation between carcinoma of the rectum and physical activity was not certain, which was consistent with the result of this research. This research showed that farmer is related to colon cancer in single factor analysis because farmers attend more physical activity, which hint that physical activity (consist of professional physical activity and amateur physical activity) can protect colon cancer. This research did not find that carcinoma of the rectum is statistically different with farmer, which was consistent with the report result before.

**Table 4**: Relation between smoking and colorectal cancer

| Living habit | | Contrast | Colon cancer | | Carcinoma of the rectum | |
|---|---|---|---|---|---|---|
| | | Cases | Cases | Test value | Cases | Test value |
| History of smoking | Yes | 174 | 40 | | 44 | |
| | No | 238 | 53 | $0.019^b$ | 70 | $0.487^b$ |
| Types of cigarettes | Have a filter | 120 | 19 | | 24 | |
| | Without a filter | 9 | 4 | $6.758^b$ | 4 | $3.707^b$ |
| | Both | 45 | 17 | | 16 | |
| Smoking age Passive smoking | Non-smoker | 164 | 38 | $0.430^a$ | 43 | $0.894^a$ |
| | No | 124 | 19 | | 26 | |
| | Yes | 114 | 34 | $4.581^{b*}$ | 44 | $4.844^{b*}$ |

Notes: a is nonparametric value Z, b is value $X^2$*P<0.05

Disease History of and Colorectal Cancer Many research study the relation of intestinal polyp and colorectal cancer, which thought that intestinal polyp was the pathogenesis or precancerosis lesions of carcinoma of the rectum. As the statistics show, the incidence of colorectal cancer in colon intestinal polyp patients is 5 times of non colon intestinal polyp patients. The oversea research reported that the incidence risk of colorectal cancer was closely related to the duration time and lesion range, but the mechanism of intestinal inflammation lead to the increase of risk of colorectal cancer was not confirmed. So far, research thought that reactive oxygen and nitrogen produced by inflammatory cells might be interacted with the critical gene that attend canceration, such as DNA base splicing. Bilharziasis is closely related with colorectal cancer. And one research of Guo Zhirong showed that the population distribution feature of colorectal cancer in Kunshan tend to be consistent with Zhangjia Gang which is the non-bilharziasis endemic area 20 years after the elimination of bilharziasis. Bilharziasis increasing the risk of colorectal cancer might lead to change of inflammatory bowel mucosa which would cause chronic ulcer, epithelial hyperplasia and inflammatory polyp because of eggs deposition and poison stimulation. Bilharziasis night cause inflammatory stimulation to intestinal canal and intestinal polyp can increase the incidence rate of intestinal inflammation as well, which made these three kinds of history of disease increase the risk of colorectal cancer.

History of disease in this research is similar to the report result in the past. Single factor analysis show that history of colon polyp, colonitis and bilharziasis is statistically related to colorectal cancer. However, the third classification only shows that bilharziasis was closely related to the incidence of carcinoma of the rectum. The result found that history of colon polyp and bilharziasis is statistically related whit colorectal cancer and can increase the incidence rate of colorectal cancer by using unconditional Logistic stepwise regression model to analyze the disease history related with colorectal cancer.

## CONCLUSION

This research took Jiashan, Zhejiang, the high incidence area of colorectal cancer as research site to make questionnaire survey of epidemiology by method of cases control to understand the living style, food category and intake of nutrient and selectively analyzed relation of dietary nutrient intake amount and colorectal cancer. First, adopt single factor analysis and classification tree analysis to select the research factor, and then put the variable whose significant level was lower than 0.05 in every analysis method into regression model to analysis. That can comprehensively select the variable that is related to colorectal cancer and make a further verification. Summary of this research is as follows: general condition and single factor analysis of colorectal cancer showed that colon cancer was significantly related with age and profession. It was not found that carcinoma of the rectum was related with age and profession and they were not entering into classification tree model. Disease history and colorectal cancer single factor analysis result, colon cancer and intestinal polyp, perianal cyst and schistosomiasis were all statistically related. As well, carcinoma of the rectum and intestinal polyp, perianal cyst and schistosomiasis were statistically related. And the statistically significance of disease history of colorectal cancer with high blood pressure, diabetes and gastritis have not been found. The classification tree model showed that the colon cancer positive rate of people who had schistosomiasis history was higher than that of people who do not have schistosomiasis history. Make a multi-factor analysis of the variable which was put into the model in classification tree analysis and whose significant level was less than 0.05 in single factor analysis. And the result showed that the colon cancer risk of patients who had a history of intestinal polyp and schistosomiasis were significantly higher. Likewise, the relation between history of intestinal polyp and schistosomiasis was statistically significant.

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