RESEARCH ARTICLE

The Association between Lifestyle, Occupational, and Reproductive Factors and Colorectal Cancer Risk

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Abstract

Objective: Association of lifestyle, reproductive and environmental factors has been investigated with increased risk of colorectal cancer in different studies. We explored evidence and investigated association between various risk factors and colorectal cancer. **Methods:** This case- control study was conducted 155 colorectal cancer patients and 150 hospital-controls. We obtained detailed lifestyle, occupational, reproductive information from both groups. Chi-Square test and Logistic regression model were used to evaluate the risk factors of colorectal cancer. **Results:** The results showed that frequent intake of fruits, chicken, fish and alcohol drinking were associated with risk for colorectal cancer. Agricultural occupation (OR=7.003, 95% CI=2.19-22.38) and industrial exposure (OR=1.97, 95% CI=0.91-4.22) were associated significantly with risk for colorectal cancer. Regarding reproductive factors, women who reported less than 3 pregnancies was associated with an increased risk of colorectal carcinoma (OR=2.88, 95% CI=1.15-7.17). We did not find significant association between other reproductive factors and colorectal cancer risk in women after adjusting for demographic factors. **Conclusion:** In this case-control study we observed that agricultural occupation, industrial exposure and high consumption of fish and less than 3 pregnancies in women were associated with an increased risk of colorectal carcinoma.

Keywords: Colorectal cancer- lifestyle- occupation- risk factors

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Introduction

Colorectal cancer constitutes a major portion of the global burden in developed countries. A rapid increase in colorectal cancer incidence has been observed in developing countries where the incidence was formerly low (Parkin et al., 2005) .Colorectal cancer is the third most common cancer in men and second most common in women (Jemal et al., 2011). The incidence of colorectal cancer (CRC) is lower in Iran than in western countries, being the fifth and third most common cancer in men and women respectively. However, its incidence in Iran has increased recently. Thus, the importance of CRC as a public health problem is increasing in Iran (Momenyan et al., 2016).

As survival rates increase for patients that treated with colorectal cancer, it is necessary to consider the self-management related to a range of daily tasks. Modifiable factors correlated with higher CRC risk include lifestyles (alcohol intake, obesity, smoking), the environmental and industrial pollutions (Lo et al., 2007). Research has shown that lifestyles factors (diet, physical activity, alcohol, smoking and obesity) have the potential to reduce or increase morbidity and mortality in cancer survivors (Calle et al., 2003). Pregnancy leads to substantial changes in the hormonal milieu, which may be protective against colorectal cancer, Also experimental studies indicate that estrogens may play a protective role in colorectal carcinogenesis either indirectly by reducing secondary bile acids and insulin-like growth factor-I or directly by regulating cell growth in the colonic epithelium and inhibiting cell proliferation of colorectal tumors by binding to the estrogen receptor (Martineti et al., 2005). These features reasonably led that we investigate occupational, lifestyle and reproductive factors in relation to colorectal cancer risk.

Materials and Methods

Study Population

This case-control study was conducted on 155 patients with colorectal cancer and 150 hospital-based controls who referred to Pars hospital in Tehran, Iran during 2015-2016. The patients were older than 18 years and without psychiatric disorders and with ability to complete the self-administered questionnaires. Also

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patients were eligible if they were diagnosed one year before interview date with primary malignancy in the colon or rectum. Patients with anal cancer and Crohn's disease were excluded. All controls were chosen based on frequency-matched to patients on age (± 5-years) and sex. After consent, the patients and controls completed following questionnaires: The short demographic characteristics, lifestyle, medical, occupational, family and reproductive histories of study population with colorectal cancer. This study was approved by the Ethic Committee of Qom University of medical sciences.

Medical History

Data on medical conditions were derived from self-reported medical history (i.e. rectal bleeding and chronic constipation) at least one year prior to the diagnosis date for patients and one year prior to study date for controls. Body mass index (BMI; kg/m2) was calculated from height.

Reproductive History

Information on menstrual and reproductive factors was obtained from 58 female colorectal cancer patients and 61 female controls. Women were completed the reproductive histories questionnaire including Age at menarche, age at first birth, number of pregnancies and average duration of lactation for each baby.

Occupational History and Exposures

Participants who reported jobs of farming for the longest duration in their lifetime or non-farming were completed Information including occupation history. Exposure to industrial materials was defined as being in contact with any of following substances for at least 8 hours a week for a year (yes vs. no): solvents, paint thinners, printer's inks or dyes, paints, lacquer, pigments, motor oils, gasoline, petroleum, car exhaust, diesel fuel, fumes, natural gas, tar, mineral oil, hydrochloric acid, bleach or cleansers, dry cleaning fluids, leather, tanning solutions, rubber products, glues, plastics, resins, sawdust, wood dust, coal dust, metals, radioactive materials, or asbestos.

Lifestyle history

At the baseline interview, all lifestyle factors were collected by self-report. Participants completed a questionnaire including consumption frequency of the vegetable, fruit, red meat, chicken and fish. Also questions on other lifestyle factors including alcohol drinking, tobacco consumption and physical exercise were completed.

Statistical Analysis

For data analysis, variables differences between the patients and controls were assessed by Chi-square test. Logistic regression model was used to calculate the odds ratio (OR) and 95% confidence intervals (95% CI). The associations between cancer and risk factors were shown by odds ratio. Data were analyzed using IBM SPSS software version 21. Level of significant was considered at $P < 0.05$.

Results

The analysis was based on 155 patients (92 men and 58 women). and 150 controls (89 men and 61 women). The mean age of patients was 54.36 ± 11.78 years with a range 25-83, and the mean age of controls was 54.05 ± 11.28 years with a range 24-74. Some demographic and medical histories were significantly different across the patients and controls groups such as residence distribution (P=0.002), Rectal bleeding (P<0.0001) and Chronic constipation (P=0.001). There was any significant difference between patients and control groups according to age and sex (Table 1).

Lifestyle factors were evaluated and results of univariate analysis showed that alcohol drinking, fruits consumption, chicken consumption and fish consumption were associated with risk for colorectal cancer (Table 2). In multivariate analysis after adjusting other lifestyle factors and demographic factors, chicken (OR=0.15, 95% CI=0.05-0.45) and fish consumption (OR=5.74, 95% CI=2.18-15.11) were significantly correlated with colorectal cancer risk. Based on the crude OR estimated by the logistic model, there were significant associations between agricultural occupation and industrial exposure with colorectal cancer risk (Table 2). Based on the adjusted OR, agricultural occupation was significantly

Table 1. Association of Demographic, Socioeconomic, and Medical Histories of Study Population with Colorectal Cancer

Factor	Number		p-value
	patients	controls	
Gender			
Female	58 (48.7)	61 (51.3)	0.723
Male	92 (50.8)	89 (49.2)	
BMI	25.85 ± 3.99	26.58 ± 3.69	0.103
age	54.36 ± 11.78	54.05 ± 11.28	0.817
Educational level			
<High school	27 (46.6)	31 (53.4)	0.665
High school graduation	66 (50)	66 (50)	
University	58 (53.7)	50 (46.3)	
Residence			
Rural	5 (20.8)	19 (79.2)	0.002
Urban	150 (53.4)	131 (46.6)	
Family history of any cancer			
Yes	75 (49)	78 (51)	0.326
No	66 (55)	54 (45)	
Family history of colorectal cancer			
Yes	25 (47.2)	28 (52.8)	0.407
No	114 (53.5)	99 (46.5)	
Rectal bleeding			
Yes	93 (86.1)	15 (13.9)	<0.001
No	48 (31)	107 (69)	
Chronic constipation			
Yes	53 (70.7)	22 (29.3)	0.001
No	93 (47.4)	103(52.6)	

Numbers and row percentages (in parentheses); Discrepancies in the totals are due to missing covariate values.

Table 2. Association of Life Style Factor and Occupational History of Study Population with Colorectal Cancer

	Number					
	patients	controls	Crude OR (95% CI)	p-value	Adjusteda OR (95% CI)	p-value
Life style factors						
Tobacco consumption						
Yes	32 (44.4)	40 (55.6)	0.71 (0.42-1.21)	0.21	0.20 (0.06-1.63)	0.15
No	123 (52.8)	110 (47.2)	(reference)			
Habit of alcohol drinking						
Yes	19 (30.6)	43 (69.4)	0.34 (0.19-0.63)	0.001	0.37 (0.12-1.16)	0.09
No	136 (56)	107 (44)	(reference)			
Habit of smoking						
current smoker	10 (43.5)	13 (56.5)	0.74 (0.31-1.76)	0.49	1.20 (0.27-5.31)	0.8
former smoker	18 (51.4)	17 (48.6)	1.02 (0.50-2.08)	0.95	0.83 (0.24-2.82)	0.76
Never smoker	114 (50.9)	110 (49.1)	(reference)			
habitual physical exercise						
None	73 (59.3)	50 (40.7)	1.57 (0.89-2.78)	0.11	2.44 (0.92-6.44)	0.07
Max 2 h/week	40 (47.6)	44 (52.4)	0.98 (0.53-1.81)	0.95	1.49 (0.60-3.68)	0.38
>2 h/week	38 (48.1)	41 (51.9)	(reference)			
Vegetables consumption frequency						
Frequent consumption	14 (37.8)	23 (62.2)	0.62 (0.30-1.29)	0.2	0.71 (0.16-3.04)	0.64
Moderate consumption	38 (57.6)	28 (42.4)	1.40 (0.79-2.46)	0.2	1.66 (0.67-4.07)	0.26
Rare/no consumption	94 (49.2)	97 (50.8)	(reference)			
Fruits consumption frequency						
Frequent consumption	48 (40.3)	71 (59.7)	0.29 (0.11-0.77)	0.013	0.76 (0.23-2.51)	0.65
Moderate consumption	87 (56.1)	68 (43.9)	0.59 (0.21-1.43)	0.22	0.68 (0.21-2.19)	0.52
Rare/no consumption	16 (69.6)	7 (30.4)	(reference)			
Red meat consumption frequency						
Frequent consumption	102 (54.3)	86 (45.7)	1.30 (0.52-3.21)	0.56	3.23 (0.88-11.90)	0.077
Moderate consumption	39 (44.8)	48 (55.2)	0.89 (0.34-2.32)	0.81	2.06 (0.46-9.12)	0.33
Rare/no consumption	10 (47.6)	11 (52.4)	(reference)			
Chicken consumption frequency						
Frequent consumption	102 (47.4)	113 (52.6)	0.41 (0.19-0.88)	0.023	0.15 (0.05-0.45)	<0.001
Moderate consumption	25 (55.6)	20 (44.4)	0.57 (0.22-1.44)	0.23	0.51 (0.10-2.50)	0.414
Rare/no consumption	24 (68.6)	11 (31.4)	(reference)			
Fish consumption frequency						
Frequent consumption	40 (71.4)	16 (28.6)	3.12 (1.54-6.30)	0.001	5.74 (2.18-15.11)	<0.001
Moderate consumption	57 (44.2)	72 (55.8)	0.99 (0.58-1.67)	0.96	2.69 (1.17-6.19)	0.019
Rare/no consumption	44 (44.4)	55 (55.6)	(reference)			
occupational history factors						
Occupation						
Farming- related	33 (86.8)	5 (13.2)	7.94 (2.9-21.09)	<0.001	7.003 (2.19-22.38)	0.001
Non- farming	103 (45.4)	124 (54.6)	(reference)			
Industrial exposure						
Yes	39 (56.5)	30 (43.5)	2.007 (1.09-3.66)	0.024	1.97 (0.91-4.22)	0.082
No	46 (39.3)	71 (60.7)	(reference)			

a, Also adjusted for age (continuous); gender (male, female); residence (rural, urban)

correlated with colorectal cancer risk (OR=7.003, 95% CI=2.19-22.38).

We did not find significant association between reproductive factors, including age at menarche, age at first birth, number of pregnancies and average duration of lactation with colorectal cancer risk in women after adjusting for demographic factors (Table 3). Nevertheless, we observed in univariate analysis that women who reported less than 3 pregnancies was associated with an increased risk of colorectal carcinoma among women

Table 3. Association of Menstrual and Reproductive Factors of Study Population with Colorectal Cancer

Factors		Number					
		patients	controls	Crude OR (95% CI)	p-value	Adjusteda OR (95% CI)	p-value
Age at menarche							
	<14	30 (51.7)	28 (48.3)	0.70 (0.31-1.55)	0.38	0.80 (0.29-2.23)	0.67
	>=14	26 (60.5)	17 (39.5)	(reference)			
Number of pregnancies							
	<3	49 (59)	34 (41)	2.88 (1.15-7.17)	0.023	1.43 (0.46-4.41)	0.53
	>=3	9 (33.3)	18 (66.7)	(reference)			
Average duration of lactation (months/child)							
	<6	21 (47.7)	23 (52.3)	1.15 (0.52-2.53)	0.71	1.33 (0.47-3.76)	0.57
	>=6	26 (44.1)	33 (55.9)	(reference)			
Age at first birth (years)							
	<25	39 (46.4)	45 (53.6)	3.46 (0.91-13.14)	0.068	1.64 (0.32-8.32)	0.54
	>=25	3 (20)	12 (80)	(reference)			

a. Also adjusted for age (continuous); BMI; residence (rural, urban); Only female study participants were included in the analyses; and column total may be different due to missing data.

(OR=2.88, 95% CI=1.15-7.17).

Discussion

This study illustrated the role of lifestyle, occupational and reproductive histories factors in colorectal cancer etiology in a developing country. In this case-control study we observed that agricultural occupation, industrial exposures, alcohol drinking, fruits consumption, chicken consumption, fish consumption and number of pregnancies were associated with risk of colorectal cancer. The etiology of colorectal cancer is rather poorly understood, and the mechanism for the various dietary factors is likely to differ. Evidence from this study indicates that the risk of colorectal cancer is decreased by alcohol drinking. Marmot et al., (2007) found similar result to ours that the consumption of alcohol is associated with lower risk of colorectal cancer. The epidemiological evidence has been complemented by recent molecular evidence on mechanisms that could explain the association in this study (Boffetta and Hashibe, 2006). Most previous studies have found an association between alcohol drinking and colorectal cancer that contrast with our finding (Moskal et al., 2007) which alcohol is not a carcinogen itself, but acts as a tumor promoter and co-carcinogen. Alcohol also acts as a solvent and thus might increase the exposure to other carcinogens by increasing the penetration of carcinogens into the cell (Marmot et al., 2007) .

In this study, red meat consumption was not associated with colorectal cancer risk, but this was in contrast with other study. The four studies were reported an increased risk of colorectal cancer with increased consumption of red meat (Aykan, 2015; Bernstein et al., 2015; Carr et al., 2016; Domingo and Nadal, 2017). This difference may be attributed to our sample size.

We found that high consumption of chicken and fruit were associated with decreased risks of colorectal cancer. Fruits and vegetables are good source of components of fiber and folic acid, reported to have anti-carcinogenic effects (Ryan-Harshman and Aldoori, 2007) . Terry et al., (2001) examined fruit, vegetable, and fiber intake and risk of colorectal cancer among Swedish women, and similar to our findings they reported that high consumption of fruit was associated with a 32% reduction in risk of colorectal cancer. Levi et al., (2001) found a significant inverse relationship between fiber intake and risk of colorectal cancer (odds ratio 0.57, 95% confidence interval 0.47–0.68). van Duijnhoven et al., (2009) suggested that the association of fruit and vegetables with CRC risk may be a reflection of increased intake of other food groups.

A protective effect of poultry (usually chicken) consumption was reported in one study only Willett et al., (1990), and similar to our findings. In the other studies, poultry intake was not significantly associated with colorectal cancer risk (Järvinen et al., 2001; Carr et al., 2016; Ward et al., 2016; Wu et al., 2016). Angelo et al., (2016) that found higher consumption of beef, chicken was associated with increased risks of colorectal cancer in brazil contrast with our finding. It is also important to conduct epidemiological studies that allow clearly establish if the consumption of poultry is associated or not with an increased risk of CRC. In this study high consumption of fish was associated with increased risks of colorectal cancer. Other studies reported a significant positive association between smoked and salted fish with risk of colorectal cancer and suggested that this finding may have been due to the nitrosamine content of these types of fish (Knekt et al., 1999; Cross and Sinha, 2004) Our findings may also be limited by the information of questionnaire for these types of fish intake. In Japan, one study observed that the high consumption of fish may be associated to a lower risk of the colorectal cancer (Lee et al., 2008) that contrast with our finding. Fish intake was not associated with colorectal cancer risk in the most recently published prospective (English et al., 2004; Kobayashi et al., 2004).

Our research has shown that agricultural occupation, industrial exposures and rural residence distribution were associated with a higher risk of colorectal cancer. Our findings are in agreement with research regarding

the role of occupational exposures in colorectal cancer that exposed to industrial materials was associated with 2-4 times higher risk for large bowel cancer in Canada and China (Dumas et al., 2000; Roos et al., 2005). Rural residency and agricultural occupations have been associated with a lower risk of colorectal cancer when compared to urban residency and non- agricultural occupation (Wang et al., 2002). Geographical distribution of high colorectal cancer incidence tends to be parallel with regions of high agricultural activity in the U.S (Carozza et al., 2008). we think that intense environmental pollution and agricultural occupation may help to explain a higher risk of colorectal cancer.

No significant associations were found for reproductive factors and colorectal cancer risk in women, that is consistent with most of the study (Akhter et al., 2008; Kabat et al., 2008). we observed in univariate analysis that demonstrated inverse associations of higher pregnancy with colorectal cancer risk. It has been hypothesized that hormonal changes associated with pregnancy might interact with bile-acid or estrogen receptors, resulting in a reduced risk for colorectal cancer (Potter, 1995). Pregnancy leads to substantial changes in the hormonal milieu, which may be protective against colorectal can¬cer. For example, during gestation, production of ovarian estradiol ceases and the predominant estrogen in circulation is estrone (Melmed et al., 2015), Whereas estradiol has been demonstrated to have proliferative properties in colorectal cancer cell lines (Di Domenico et al., 1996) estrone has been shown to exert anti-proliferative effects in colorectal tissues (English et al., 1999).

In conclusion, we observed that agricultural occupation, industrial exposure and fish consumption in colorectal cancer patients and less than 3 pregnancies in women were associated with an increased risk of colorectal carcinoma.

In addition, we lacked more detailed data on other reproductive factors, such as age at birth of last child, breastfeeding history, and abortion history, which have been linked with colorectal cancer. The other limitation of our study was the relatively small number of female, which made the model we used under powered for associations.

Also Further prospective studies that directly assess dose-response relationship, the actual levels in exposed and non-exposed individuals in relation to colorectal cancer risk would be highly informative. Future studies should focus on investigating the biological mechanisms of environmental, industrial, and reproductive factors in colorectal carcinogenesis and other health conditions are urgently needed.

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References

Akhter M, Inoue M, Kurahashi N, et al (2008). Reproductive factors, exogenous female hormone use and colorectal cancer risk: the Japan public health center-based prospective study. *Eur J Cancer Prev*, **17**, 515-24.

Angelo SN, Lourenço GJ, Magro DO, et al (2016). Dietary risk factors for colorectal cancer in Brazil: a case control study. *J Nutr*, **15**, 20.

Aykan NF (2015). Red meat and colorectal cancer. *Oncol Rev*, **9**, 288.

Bernstein AM, Song M, Zhang X, et al (2015). Processed and unprocessed red meat and risk of colorectal cancer: analysis by tumor location and modification by time. *PLoS One*, **10**, e0135959.

Boffetta P, Hashibe M (2006). Alcohol and cancer. *Lancet Oncol*, **7**, 149-56.

Calle EE, Rodriguez C, Walker-Thurmond K, et al (2003). Overweight, obesity, and mortality from cancer in a prospectively studied cohort of US adults. *N Engl J Med*, **348**, 1625-38.

Carozza SE, Li B, Elgethun K, et al (2008). Risk of childhood cancers associated with residence in agriculturally intense areas in the United States. *Environ Health Perspect*, **116**, 559–65.

Carr PR, Walter V, Brenner H, et al (2016). Meat subtypes and their association with colorectal cancer: Systematic review and meta-analysis. *Int J Cancer*, **138**, 293-302.

Cross AJ, Sinha R (2004). Meat-related mutagens/carcinogens in the etiology of colorectal cancer. *Environ Mol Mutagen* **44**, 44-55.

Di Domenico M, Castoria G, Bilancio A, et al (1996). Estradiol activation of human colon carcinoma-derived Caco-2 cell growth. *Cancer Res*, **56**, 4516-21.

Domingo JL, Nadal M (2017). Carcinogenicity of consumption of red meat and processed meat: A review of scientific news since the IARC decision. *Food Chem Toxicol*, **105**, 256-61.

Dumas S, Parent MÉ, Siemiatycki J, et al (2000). Rectal cancer and occupational risk factors: A hypothesis-generating, exposure-based case-control study. *Int J Cancer*, **87**, 874-9.

English DR, MacInnis RJ, Hodge AM, et al (2004). Red meat, chicken, and fish consumption and risk of colorectal cancer. *Cancer Epidemiol Biomarkers Prev*, **13**, 1509-14.

English MA, Kane KF, Cruickshank N, et al (1999). Loss of estrogen inactivation in colonic cancer. *J Clin Endocrinol Metab*, **84**, 2080-5.

Järvinen R, Knekt P, Hakulinen T, et al (2001). Dietary fat, cholesterol and colorectal cancer in a prospective study. *Br J Cancer*, **85**, 357.

Jemal A, Bray F, Center MM, et al (2011). Global cancer statistics. *CA Cancer J Clin*, **61**, 69-90.

Kabat GC, Miller AB, Rohan TE (2008). Oral contraceptive use, hormone replacement therapy, reproductive history and risk of colorectal cancer in women. *Int J Cancer*, **122**, 643-6.

Knekt P, Järvinen R, Dich J, et al (1999). Risk of colorectal and other gastro-intestinal cancers after exposure to nitrate, nitrite and N-nitroso compounds: a follow-up study. *Int J Cancer*, **80**, 852-6.

Kobayashi M, Tsubono Y, Otani T, et al (2004). Fish, long-chain n-3 polyunsaturated fatty acids, and risk of colorectal cancer in middle-aged Japanese: the JPHC study. *Nutr Cancer,* **49**, 32-40.

Lee SI, Moon HY, Kwak JM, et al (2008). Relationship between meat and cereal consumption and colorectal cancer in Korea and Japan. *J Gastroenterol Hepatol*, **23**, 138-40.

Levi F, Pasche C, Lucchini F, et al (2001). Dietary fibre and the risk of colorectal cancer. *Eur J Cancer Prev*, **37**, 2091-6.

Lo A-C, Soliman AS, El-Ghawalby N, et al (2007). Lifestyle, occupational, and reproductive factors in relation to pancreatic cancer risk. *Pancreas*, **35**, 120-9.

Marmot M, Atinmo T, Byers T, et al (2007). Food, nutrition,

physical activity, and the prevention of cancer: A global perspective.
Martineti V, Picariello L, Tognarini I, et al (2005). ERβ is a potent inhibitor of cell proliferation in the HCT8 human colon cancer cell line through regulation of cell cycle components. *Endocr Relat Cancer*, **12**, 455-69.
Melmed S, Polonsky KS, Larsen PR, et al (2015). Williams textbook of endocrinology, Elsevier Health Sciences.
Momenyan S, Sadeghifar M, Sarvi F, et al (2016). Relationship between urbanization and cancer incidence in Iran using quantile regression. *Asian Pac J Cancer Prev*, **17**, 113-7.
Moskal A, Norat T, Ferrari P, et al (2007). Alcohol intake and colorectal cancer risk: A dose–response meta-analysis of published cohort studies. *Int J Cancer*, **120**, 664-71.
Parkin DM, Bray F, Ferlay J, et al (2005). Global cancer statistics, 2002. *CA Cancer J Clin*, **55**, 74-108.
Roos A, Ray R, Gao D, et al (2005). Colorectal cancer incidence among female textile workers in Shanghai, China: a case-cohort analysis of occupational exposures. *Cancer Causes Control*, **16**, 1177-88.
Ryan-Harshman M, Aldoori W (2007). Diet and colorectal cancer. *Can Fam Physician*, **53**, 1913-20.
Terry P, Giovannucci E, Michels KB, et al (2001). Fruit, vegetables, dietary fiber, and risk of colorectal cancer. *J Natl Cancer Inst*, **93**, 525-33.
van Duijnhoven FJ, Bueno-De-Mesquita HB, Ferrari P, et al (2009). Fruit, vegetables, and colorectal cancer risk: the European prospective investigation into cancer and nutrition. *Am J Clin Nutr*, **89**, 1441-52.
Wang Y, Lewis-Michl EL, Hwang S-A, et al (2002). Cancer incidence among a cohort of female farm residents in New York State. *Arch Environ Occup Health*, **57**, 561-7.
Ward HA, Norat T, Overvad K, et al (2016). Pre-diagnostic meat and fibre intakes in relation to colorectal cancer survival in the European prospective investigation into cancer and nutrition. *Br J Nutr*, **116**, 316-25.
Willett WC, Stampfer MJ, Colditz GA, et al (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**, 1664-72.
Wu K, Spiegelman D, Hou T, et al (2016). Associations between unprocessed red and processed meat, poultry, seafood and egg intake and the risk of prostate cancer: A pooled analysis of 15 prospective cohort studies. *Int J Cancer*, **138**, 2368-82.