Impact of Life Habits on Colorectal Cancer

Pedro J. Tarraga López*[,1], Juan Solera Albero[2], Julio A. Carbayo Herencia[3], Jose Antonio Rodriguez Montes[4], Mateo A. López Cara[5] and Ángel Celada Rodríguez[6]

[1]*Area 5 Health Centre (Albacete), University of Castilla La Mancha, Spain*

[2]*Alcaraz Health Centre (Albacete), Spain*

[3]*Medical Corps, 14th Fighter Wing Air Base, Albacete, Spain*

[4]*University of Madrid, Spain*

[5]*Madrigueras Health Centre (Albacete), Spain*

[6]*Area 6 Health Centre (Albacete), Spain*

Abstract: *Objective*: to assess the relationship between different colorectal cancer (CC) risk factors in the province of Albacete, Spain

Subjects And Methods: the study was designed to be population-based, observational, analytical, descriptive and cross-sectional and used a questionnaire. The study area included the Primary Care Health Centres in the province of Albacete.

We compared two previously assessed areas, one with a high CC incidence and the other with a low CC incidence, along with the factors that could influence these differences. We used a questionnaire to collect personal and consumer habit data in relation to CC. We did bivariate and multivariate (logistic regression) statistical analyses.

The predictor variables considered in this model were age, gender, body mass index (BMI), level of education, intensity of physical activity, presence or absence of a disease, smoking habit (packs per year), alcohol intake, number of defecations per week, being on a diet, intake frequencies (IF) of pasta and rice, IF of eggs or omelette, IF of white fish, IF of blue fish, IF of pulses, IF of vegetables and salads, fruit, cold meats, meat, water intake and relatives with cancer.

Results: The high CC incidence areas presented an incidence between 26.9 and 30.2 cases per 100,000 citizens per year, while the rates of the low incidence areas were between 5.1 and 6.5. A total of 417 people participated (56.8% women), of whom 245 (58.8%) came from the low CC incidence area (41.2% men) and 172 (41.2%) were from the high CC incidence area (45.9% men). After adjusting the model in the logistic regression analysis, the variables related to high cancer incidence were alcohol intake, odds ratio (OR) 1,79 (CI: 1.8-2.96; P=0.024 eating eating pasta and rice more than two days per week: OR 2.23 (CI: 1.33-3.72; P=0.002); eating eggs and/or omelette more than two days per week: OR 2.68 (CI: 1.49-4.80; P=0.001), and drinking more than two litres of water per day: OR 2.87 (CI: 1.51-5.46; P=0.001. Frequent physical exercise related with a low CC incidence: OR 3.38 (CI: 1.30-8.84; P=0.013).

Conclusions: In this study, the highest CC incidence is associated with alcohol intake and a high intake of water, pasta and rice, and eggs. Doing physical exercise regularly has a protective effect.

Keywords: Colorectal Cancer-Preventions-lifestyles.

INTRODUCTION

Colorectal cancer (CC) is a frequent neoplasia in Western countries, with an incidence of 30-50 new cases per 100,000 citizens each year. It is rated as the second cause of death in the types of cancer (more than 944,000 new cases and 492,000 deaths worldwide in the year 2000) [1-2].

Time-related studies and studies about migratory populations suggest that CC depends, to a great extent, on environmental factors as evidenced by the substantial variation in the incidence observed among different countries and the marked increase in the number of new cases among populations who have migrated from low incidence areas to high incidence one.

Epidemiological studies have estimated that up to 70-80% of CC could be attributed to diet, environmental and lifestyle factors. These assertions suggest the importance of potentially modifiable causes which, to a large extent, could be prevented [3-6].

On the other hand, although environmental factors could be decisive in the aetiology of most cases, genetic susceptibility also plays a crucial role. Moreover, the fact that 75% of new cases occur in persons with no risks factors suggests that only the interaction of genetic susceptibility with the rest of the aetiologic factors involved can actually cause this neoplasia. Recent advances in the knowledge of the relation-

*Address correspondence to this author at the C/Angel 53-1E, 02002 Albacete Spain; Tel: 967 505263-967 241511; Fax: 967520526;
E-mail: pjtarraga@sescam.jccm.es

1876-8202/10

ship among genes, diet and the environment move in this direction [6-15].

Observational epidemiological studies in humans have provided substantial evidence of the correlation between CC and a high calorie diet, excessive fat intake, and excessive protein of animal origin, especially from red meat.

These findings are in agreement with laboratory studies confirming that rats whose diet containsfed with a large amount of fats present a higher CC incidence. A diet rich in saturated fats stimulates the secretion of biliary acids which could trigger this process by causing damage to the intracellular or mitochondrial membranes or being due to direct genotoxic effects.

In his studies, Burkitt already indicated a very low CC incidence in Africa where diets contain higher fibre content than diets in Western countries. The beneficial effect of fibre may be attributed to its diluting action on the carcinogens present in the colon, thus deactivating carcinogenic promoters. As it accelerates intestinal transit, it also shortens the time of contact between them and colonic mucosa.

Notwithstanding, the results obtained with case studies and controls are contradictory; while some studies show the beneficial effects of fibre intake, others do not support this hypothesis. Furthermore, some interventional studies which administered low-fat diets with a high content of fibre, fruits and vegetables did not evidence the chemopreventive role of fibre [16-28].

Other data suggest the protective role of calcium and vitamin D in CC. In addition, excessive alcohol intake, especially when associated with a diet poor in folic acid and methionine, and smoking over a prolonged period of time increase the risk of CC.

Given all the above evidence, the implication of environmental factors in the aetiology of CC seems obvious. If we were to identify and modify such factors, a large number of CC cases could be prevented. The challenge lies in determining the responsible agents in order to correct them [29, 30].

The objective of this study is to acquire knowledge of the diet and lifestyle patterns of a study population, and to evaluate the relationships among daily intake of specific food groups, lifestyle habits and CC.

METHODS

The current population of the province of Albacete is 359,010, of whom the majority live in small villages. However, the combined population of the capital city of the province and four more towns amount to more than 10,000 citizens. The majority of the population (65%) are aged between 15 and 64 years, while 17% are over 65.

The incidence and prevalence of CC in the study area between 1992 and 1999 were calculated using data from the Surgery and Anatomical Pathology Departments of the hospitals located in the province, as well as public ("Complejo Hospitalario Universitario de Albacete" and "Hospital Comarcal de Hellín"), private ("Recoletas", "Sanatorios del Rosario" and "Santa Cristina") and provincial National Cancer Registry archives. Subsequently, the same calculation was made for all 33 Health Areas into which the province is distributed.

After this detailed mapping, the three Health Areas with the highest CC incidence and the three with the lowest CC incidence were selected for the study. A systematic randomisation of citizens aged over 50 years was done using the census of the 25 villages and towns located in the high and low CC incidence areas. Thus, 445 study subjects were selected (95% confidence level) (Fig. **1**).

The inclusion criteria were defined as aged over 50 years, living in one of the selected areas, and being able to respond to the questionnaire. Those subjects in the study area who had moved to another area or had died, were substituted for the immediate person before or after them in the census.

A personalised letter was posted to each subject who participated in the study to inform that an interviewer would visit them.

The questionnaire included the following data: demographic (gender and age), personal (level of education, habits and lifestyle, and physical exercise), hygienic and dietary (intake of water, coffee, tea, herbal teas, vegetables, pulses, and fruits), smoking habit, alcohol intake and medicines (NSAIDs and laxatives), intake of vitamin supplements and dietary fibre, and defecating habit (number of defecations per week).

Possible answers were: never, almost never, daily, and twice a week or more, yes and no.

The questionnaire was correctly filled in by 417 subjects. Once the questionnaire phase was completed, all the data were introduced into the standard database.

Firstly, the descriptive statistics of each variable was carried out. The study was designed to be observational, descriptive, analytical and cross-sectional. The qualitative variables are shown as exact values and percentages, while the quantitative variables are expressed as means and standard deviations (SD).

A comparison between the means was made with the Student's t-test for independent groups and the Mann-Whitney U Test when a normal distribution (according to the Kolmogorov-Smirnoff or Shapiro Willks tests) was not attained. We used the chi-square test with the qualitative variables.

We used a logistic regression model to identify the variables that best enabled us to infer the reasons for a higher cancer incidence in some areas. β parameters were estimated by maximum likelihood.

Since the number of subjects is not very high, and the number of subjects for some variables is very close to the interval extremes (0.1), the introduction of many variables could mask the modelling process and increase the likelihood of unreliable estimates. For this reason, we established a screening criterion by univariate logistic regression for each independent variable with the dependent variable (low or high cancer incidence). Furthermore, we excluded those variables with a P value equal to or higher than 0.25 from the model. Besides, other variables whose association with cancer had been demonstrated were included in the model even if they did not reach the above-mentioned value. Of all the

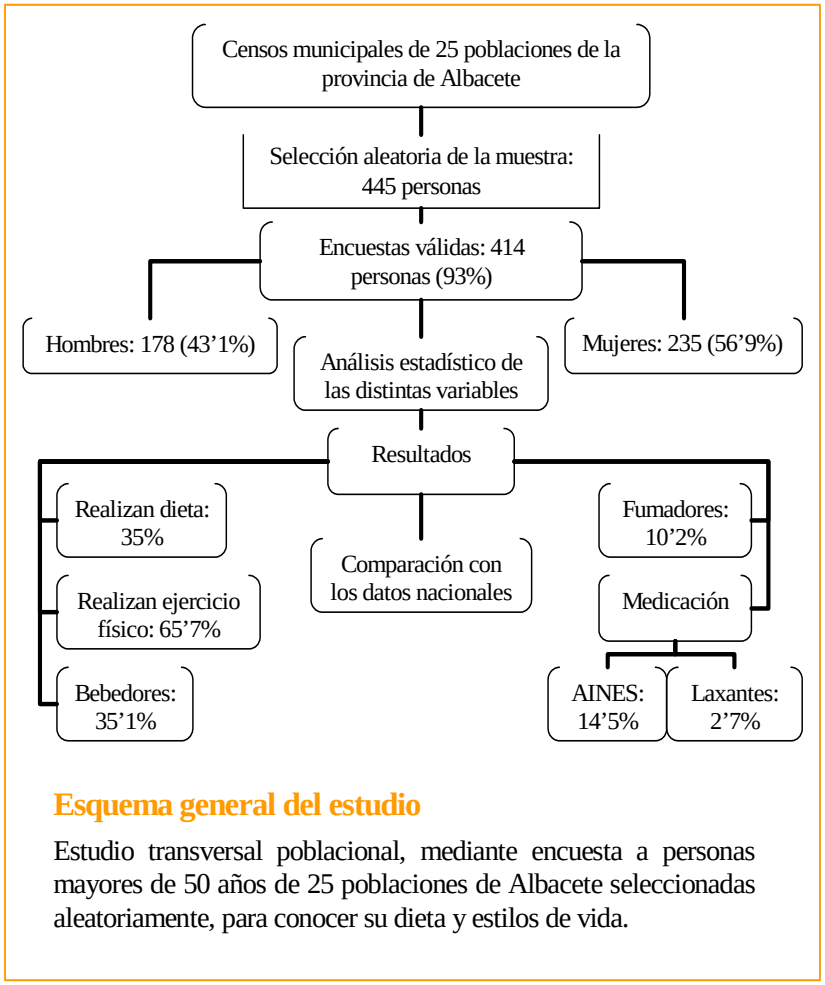

Fig. (1). General study design.

variables exploring the same situation (e.g., smoking or alcohol), we selected those of greater quality (reliability and accuracy of measures), objectivity, and simplicity.

The independent variables included in the model were age, gender, BMI, level of education, intensity and type of physical exercise practised, presence of a disease, smoking habit (best expressed as number of packs of cigarettes per year), alcohol intake, number of defecations per week, if the subject was on a diet, intake frequencies (IF) of pasta and rice, eggs or omelette, white fish, blue fish, pulses, vegetables and salads, fruit, cold meats, meat, intake of water, and relatives with cancer.

In the final model, we used the forward stepwise procedure in which we included the variables complying with the inclusion criteria (PIN ≤ 0.05). P-values < 0.05 were considered significant. The data analysis was carried out with the SPSS 10.1 statistical package for Windows.

RESULTS

1. CC Incidence in the Province of Albacete

There were 531 new cases of CC in the area during the study period of whom 291 were men (54.99%) and 240 were women (45.1%). The mean incidence rate was 15.9 per 100,000 citizens per year (Fig. **2**).

The areas with a higher incidence were Elche de la Sierra, with a rate of 30.2 per 100,000 citizens per year, followed by Alcadozo, with 28.3, and Ontur with 26.9. The areas with a lower incidence were Munera with 5.1, Ossa de Montiel with 5.9, and Balazote with 6.5. These results are shown on the incidence map of the province of Albacete (Fig. **3**), where the contrast among areas is visible, especially

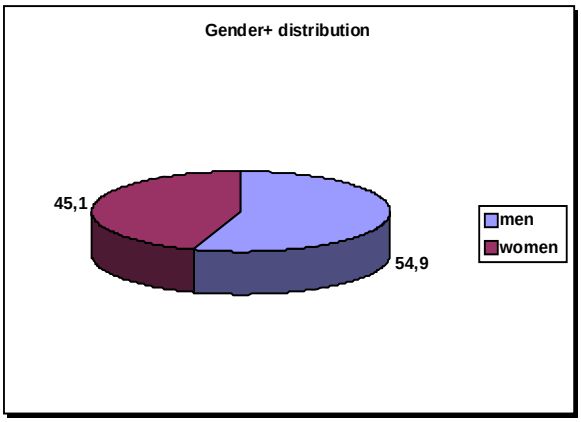

Fig. (2). Gender distribution of CC in the province of Albacete

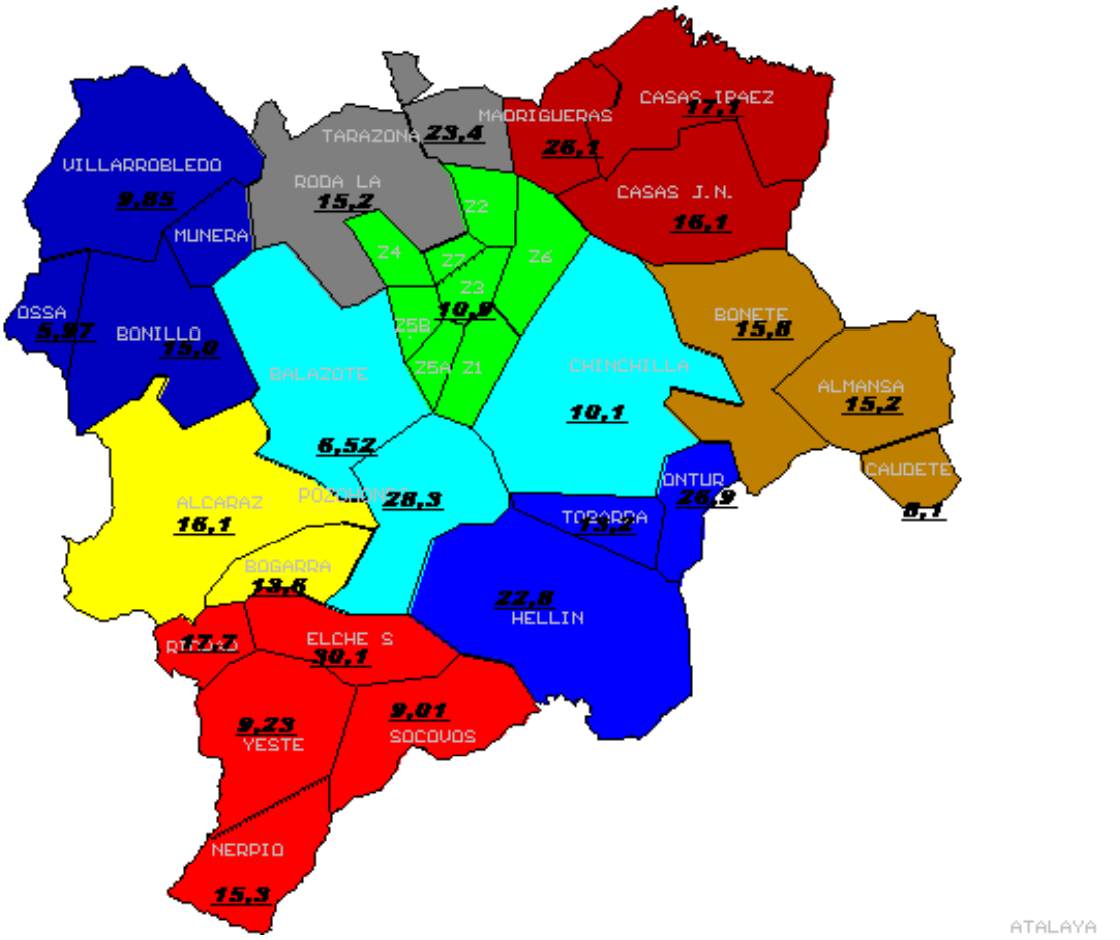

Fig. (3). Incidence map of CC in the province of Albacete

the higher incidence in the south-west compared with the north-east corner.

2. Sample Analysis

Of the 450 subjects, 414 (92%) filled the questionnaire correctly. Gender distribution was 43.1% men and 56.9% women. The mean age was 60.07 (SD 6.84; CI 95%: 66.06-68.09) for men, and 66.97 (SD 7.37; CI 95 %: 66.02-67.92) for women. The mean weight was 72.57 kg (SD 11.83), while the mean height was 161.24 cm (SD 7.91), with a mean BMI of 28.07 (SD 4.49). Eighty percent of the subjects were married, 14.7 were illiterate, 80.2% could read and write but did not hold a Certificate of Primary Education, and only 2 subjects (0.5%) had a university degree. Finally, 43.7% were retired and 41.8% were housewives.

3. Bivariate Analysis: Relationship Between the Outcome and the Explanatory Variables (Table 1)

The predictor variables considered for this model were age, gender, BMI, level of education, intensity and type of physical activity practised, presence of a disease, smoking habit (best expressed as number of packs of cigarettes per year), alcohol intake, number of defecations per week, if the subject was on a diet, intake frequencies (IF) of pasta and rice, eggs or omelette, white fish, blue fish, pulses, vegetables and salads, fruit, cold meats, meat, intake of water, and relatives with cancer.

The selected variables were the following:

- Gender
- Marital status
- Level of education
- Occupation
- Presence of a disease
- Hours of sleep per day
- Physical exercise
- Smoking habit
- Alcohol intake
- Intake of NSAIDs and laxatives
- Number of defecations per week
- Diet
- Place meals are eaten
- Coffee intake
- Family history

Table 1. Crude Odds Ratios of the Qualitative Variables Analysed in Relation to the Presence of a High CC Incidence

	OR (95% CI)	P
Gender :		
Women	1	0.34
Men	1.21(0.82-1.80)	
Marital status:		
Married	1	0.39
Other (single, separated, widowed)	0.80(0.49-1.33)	
Level of education:		
Illiterate	1	0.24
Can read and write	1.41(0.80-2.49)	0,14
Completed studies	2.15(0.79-5.87)	
Physical activity:		
Sedentary	1	0.06
Moderate	2.37(0.97-5.81)	0.14
Intense	1.97(0.80-4.89)	
Presence of a disease:		
NO	1	**0.02**
YES	0.58(0.37-0.92)	
Hours sleep/day:		
Under 8 hours	1	0.86
Eight hours or more	1.04(0.70-1.54)	
Physical exercise:		
NO	1	0.17
YES	1.34(0.89-2.02)	
Type of exercise:		
None	1	**0.005**
Walking	0.29(0.12-0.69)	**0.014**
Other	0.35(0.15-0.81)	
Frequency of physical exercise:		
Never	1	0.84
Daily	0.94(0.53-1.67)	0.25
Sporadically	1.37(0.80-2.36)	
Smoking habit:		
Non-smoker	1	0.59
Smoker	1.16(0.68-1.96)	0.22
Former smoker	1.60(0.76-3.36)	
Product smoked:		
Non-smoker	1	0.59
Cigarettes	0.46(0.16-1.33)	0.14
Cigars	0.43(0.14-1.31)	
Cigarettes/day:		
Non-smoker	1	0.61
≤ 20 c/day	0.83(0.40-1.70)	0.67
> 20 c/day	0.84(0.37-1.89)	
Packs smoked/year:		
Non-smoker	1	0.97
≤ 44 packs/year	0.99(0.55-1.77)	0.79
> 44 packs/year	1.11(0.53-2.3)	
Alcohol:		
Do not drink	1	**0.006**
Drinks alcohol	1.77(1.18-2.67)	

(Table 1). Contd…..

	OR (95% CI)	**P**
Degree of alcohol intake:		
Do not drink	1	**0.05**
< 30 gr/day	0.47(0.25-0.86)	0.41
>= 30 gr/day	0.75(0.38-1.50)	
Take NSAIDs and/or laxatives:		
NO	1	0.88
YES	1.04(0.64-1.67)	
Defecations/week:		
> 3 times	1	0.45
≤ 3 times	0.59(0.15-2.31)	
On a diet:		
NO	1	**0.04**
YES	0.65(0.43-0.99)	
Milk intake frequency:		
Less than 3 days per week	1	0.9
Between 3 and 7 days per week	1.04(0.56-1.92)	
Bread intake frequency :		
Less than 3 days per week	1	0.3
Between 3 and 7 days per week	1.72(0.6-5)	
Brown bread intake frequency:		
Less than 3 days per week	1	0.6
Between 3 and 7 days per week	0.8(0.33-1.96)	
Cake intake frequency:		
Less than 3 days per week	1	0.6
Between 3 and 7 days per week	1.1(0.74-1.67)	
Biscuit intake frequency:		
Less than 3 days per week	1	0.8
Between 3 and 7 days per week	0.8(0.54-1.2)	
Pasta and rice intake frequency:		
Less than 3 days per week	1	**0.01**
Between 3 and 7 days per week	2.15(1.4-3.4)	
Eggs and/or omelette intake frequency:		
Less than 3 days per week	1	**0.001**
Between 3 and 7 days per week	2.95(1.75-5)	
Eggs and/or omelette intake frequency:		
Less than 3 days per week	1	0.25
Between 3 and 7 days per week	1.35(0.31-2.3)	
Blue fish intake frequency:		
Less than 3 days per week	1	0.05
Between 3 and 7 days per week	1.81(0.98-3.36)	
Vegetables intake frequency:		
Less than 3 days per week	1	0.85
Between 3 and 7 days per week	1.06(0.6-1.9)	
Fruits intake frequency:		
Less than 3 days per week	1	0.24
Between 3 and 7 days per week	1.87(0.65-5.3)	
Olive oil intake frequency:		
Not everyday	1	0.52
Everyday	1.34 (0.55-3.23)	

(Table 1). Contd…..

	OR (95% CI)	P
Butter intake frequency:		
Less than 3 days per week	1	0.5
Between 3 and 7 days per week	0.6(0.11-2.5)	
Sausage-like products intake frequency:		
Less than 3 days per week	1	**0.042**
Between 3 and 7 days per week	1.6 (1.02-2.5)	
Meat intake frequency:		
Less than 3 days per week	1	**0.025**
Between 3 and 7 days per week	1.6 (1.06-2.5)	
Tea/coffee intake frequency:		
NO	1	0.16
YES	1.3(0.9-1.95)	
Herbal tea intake frequency:		
NO	1	0.63
YES	0.9(0.6-1.4)	
Water intake:		
Less than 1 litre per day.	1	**0.001**
Between 1 and 2 litres per day.	0.3(0.17-0.6)	**0.001**
More than 2 litres per day.	0.35(0.2-0.6	
Take a vitamin supplement:		
NO	1	0.47
YES	1.5(0.6-3.9)	
Take a dietary fibre supplement:		
NO	1	0.99
YES	0.00	
Relatives with cancer:		
NO	1	**0.036**
YES	0.65(0.44-0.97)	
First-degree relatives with cancer:		
NO	1	**0.01**
YES	2.7(1.3-5.74)	
Second-degree relatives with cancer:		
NO	1	**0.024**
YES	2.9(1.2-7.3)	

OR: *Odds ratio*. CI: confidence interval of the OR.

- Intake of milk
- Intake of bread
- Intake of pasta
- Intake of eggs
- Intake of fish
- Intake of pulses
- Intake of vegetables
- Intake of fruits
- Intake of olive oil
- Intake of butter
- Intake of cold meats
- Intake of meat
- Intake of water
- Intake of dietary fibre

Table **1** presents the independent variables related with a low CC incidence, which also shows that doing moderate and intense physical exercise, walking or especially other types of physical exercise, (p=0.014), prevents CC, unlike sedentariness.

The presence of a disease or alcohol intake has a significant effect on CC (p=0.02 and P=0.006, respectively).

We find that eating a healthy diet may prevent CC, but a considerable intake of pasta and rice, eggs, sausage-type products and red meats have a negative influence on CC incidence.

Hereditary factors also significantly influence CC incidence; that is, those with first- or second-degree relatives

with CC multiplies their chances of developing CC by two (p=0.01 and p=0.024, respectively).

4. Multivariate Analysis

We then carried out a lineal regression model to calculate which variables had more influence on the lowest CC incidence rates.

Table **1** offers the independent variables related to a low CC incidence. Here we observe how practicing intense physical activity almost multiplies the possibility of not developing CC by four if compared with sedentariness. Besides, not having first-degree relatives with cancer has a protective effect. In order to better understand the effect of the remaining variables, we changed the reference category of the dependent variable by maintaining the same independent variables. This result is reflected in Tables **2** and **3**. Likewise, alcohol intake multiplies the chances of developing CC by two (OR 1.79 [CI: 1.8-2.96; P=0.024]); eating pasta and rice more than two days a week presents OR 2.23 (CI: 1.33-3.72; P=0.002); eating eggs and/or omelette more than two days a week gives OR 2.68 (CI: 1.49-4.80; P=0.001). Finally, drinking more than two litres of water or more a day gives OR 2.87 (CI: 1.51-5.46; P=0.001).

DISCUSSION

Cancer and cardiovascular diseases are still the main causes of death. Epidemiologic studies into neoplasia are normally based on incidence rates (diagnosed cases) and mortality. In regions where there are no incidence or mortality data available, information about the distribution of cancer types can be obtained from relative frequency studies in which the number of tumours in a specific location can be calculated in relation to the total number of cancer cases. These studies are usually based on the case series that are observed in one or more hospitals or collected in a hospital department, these generally being anatomical pathology departments.

Colorectal cancer is a serious disease whose incidence is steadily increasing. This increase is related to diet and environmental factors as evidenced by the fact that the high incidence areas are those countries that are more socio-economically advanced; that is to say, North America and Western Europe [1-8].

Given its geographic location and economic development, the average CC incidence in Spain is 16.8 per 100,000 citizens per year in men, and 12.0 per 100,000 citizens per year in women [9-16].

According to our study, CC incidence in the province of Albacete is similar to the mean rate in Spain. In our series, CC is more frequent in men (16.8 per 100,000 citizens per year) than in women (16 per 100,000 citizens per year), although the difference is not significant. If, however, we compare these incidences with Spanish national rates (12 per 100,000 citizens per year), the incidence rate for women is much higher in the province of Albacete (17, 15 per 100,000 citizens per year), whereas that for men is very similar to the national rate [13-16].

Table 2. Odds Ratios (95% Confidence Intervals) Associated with a Low CC Incidence

	Beta	**OR (95% CI)**	**P**
Physical activity:			
Sedentary:	-0.121	1	0.632
Moderate:	1.219	0.886 (0.54-1.45)	0.013
Intense:		3.384 (1.30-8.84)	
Alcohol intake:	-0.581		
NO:		1	
YES:		0.559 (0.34-0.93)	0.024
Pasta and rice intake:	-0.800		
Less than 3 days per week:		1	0.002
3-7 days per week:		0.449 (0.27-0.75)	
Eggs and omelette intake:	-0.985		
Less than 3 days per week:		1	
3-7 days per week:		0.373 (0.21-0.67)	0.001
Water intake:			
Less than 1 litre per day:	-0.116	1	0.635
1-2 litres per day:	-1.055	0.891 (0.55-1.44)	0.001
More than 2 litres per day:		0.348 (0.18-0.66)	
Relatives with cancer:			
None:	0.246	1	0.296
First-degree relatives:	1.219	1.279 (0.81-2.28)	0.005
Other degrees:		3.383 (1.45-7.90)	

OR: *Odds ratio*. CI: Confidence interval of the OR. The constant of this model is 0.933.

Table 3. Odds Ratios (95% Confidence Intervals) Associated with a High CC Incidence

	Beta	OR (IC del 95%)	P
Physical activity:			
Sedentary:	0.121	1	0.632
Moderate:	-1.219	1.129 (0.69-1.85)	0.013
Intense:		0.296 (0.11-0.77)	
Alcohol intake:	0.581		
NO:		1	
YES:		1.788 (1.08-2.96)	0.024
Pasta and rice intake:	0.800		
Less than 3 days per week:		1	0.002
3-7 days per week: :		2.226 (1.33-3.72)	
Eggs and omelette intake:	0.985		
Less than 3 days per week:		1	
3-7 days per week:		2.678 (1.49-4.80)	0.001
Water intake:			
Less than 1 litre per day:	0.116	1	0.635
1-2 litres per day:	1.055	1.122 (0.70-1.81)	0.001
More than 2 litres per day:		2.872 (1.51-5.46)	
Relatives with cancer:			
None:	-0.246	1	0.296
First-degree relatives:	-1.219	0.782 (0.49-1.24)	0.005
Other degrees:		0.296 (0.13-0.69)	

OR: *Odds ratio*. CI: Confidence interval of the OR. The constant of this model is -0.933.
The predictor variables considered in this model are age, gender, BMI, level of education, intensity of physical activity, presence or absence of a disease, smoking habit expressed as packs smoked per year, alcohol intake, number of defecations per week, if the subject is on a diet, intake frequencies (IF) of pasta and rice, eggs or omelette, white fish, blue fish, pulses, vegetables and salads, fruits, sausage-like products, meat, water, and if a relative has cancer.
The adjustment of this model has been excellent as the Hosmer and Lemeshow test (P=0.951) gave an almost null value in the chi-square test.

Although the difference is not significant, the CC incidence rate in the low CC incidence area is higher for women than for men: 60.8% and 56.1%, respectively. However, in the high CC incidence area, the incidence rate is practically the same for men and women: 43.9% and 41.2%, respectively.

We found significant differences in CC incidence depending on geographical location, thus confirming the hypothesis that the risk for CC varies according to the places of residence. For example, Elche de la Sierra with an incidence rate of 30.3 per 100,000 citizens per year, along with Alcadozo (28.3) and Ontur (26.9), clearly differ from Munera, Ossa de Montiel and Balazote, which all have a mean incidence rate of 5.8 per 100,000 citizens per year.

In view of the results of this study, we can state that the eating habits of citizens aged over 50 years old in Albacete are:

(i) Most have three meals a day: breakfast, lunch and supper

(ii) Meals are normally eaten at home

(iii) The majority of people have healthy eating habits as they consume milk, bread, vegetables, fruits, and olive oil daily, fish (blue and white in similar proportions) every one or two days, and pulses and meat every three to six days

(iv) 44.4% of people drink one to two litres of water a day

(v) Only 3.9% of the subjects took a vitamin supplement, and a 1% of them took dietary fibre.

Remarkably, 44.4% of the questioned subjects have a family background of some kind of cancer, of which 63.2% were first-degree relatives. Taken together, breast, stomach and intestine cancers, and cancer of the larynx and upper airways, accounted for 54.3%.

There are many studies about the effect of diet on the development of CC in diverse geographic areas. However, although the influence of diet on CC was confirmed some decades ago, it has not been possible until now to unequivocally determine what food or nutrients are responsible for it.

In our study, we found no important differences in the higher CC prevalence compared with the lower CC prevalence group. It is nevertheless true that there is a lower CC incidence in the group of subjects on a diet, where $p = 0.045$.

An excessive intake of different macronutrients may involve an increased risk for CC. Nonetheless, the studies into diet patterns present serious limitations owing to the difficulty in isolating the exact ingredients of meals, which is further complicated as all foods have very varied components [6, 23-30].

Reviews into the effect of meat intake on CC incidence do not present an association among them. However, a link

has been established between both red and processed meats, and CC.

Despite the fact that we found no significant differences with this study, CC incidence is lower in the group with a lower meat intake. Likewise fish intake, irrespectively of it being white or blue, is apparently associated with lower CC incidence in the lower incidence group of our study. Several case and controlled studies have demonstrated an association between the intake of fibre, vegetables and fruit and a lower risk for CC. We also found an association between dietary fibre and lower CC incidence. Indirect information from prospective studies evaluating the effect of dietary fibre and fibre-rich diets, particularly pulses, cereals and fruit, on colorectal adenoma supports the results of our study, although not completely. Our study corroborates these works, especially as far as the intake of pulses and vegetables is concerned. Recent reviews of milk and dairy products intake have not demonstrated a protective effect on the risk for CC. In our case, we found a higher CC incidence in areas with a low milk and dairy products intake, that is, once a day or every two days, or no such intake [6, 25-30].

On the other hand, we found no association between CC and gender, marital status, level of education and occupation.

In relation to smoking habits and alcohol intake, our study mirrors their condition as carcinogen agents. Cigar smokers show a 60% incidence as opposed to the 40% incidence of non-smokers. Likewise, those who habitually drink 140 grams/week of alcohol present a 60% incidence, while drinkers of 20 grams/week have an 85.7% lower incidence.

With regard to NSAIDs and laxatives, we encountered a lower incidence in subjects who took laxatives, at 63.6%.

A daily intake of eggs seems to have a protective effect which disappears when the intake is between 3 and 6 eggs per week. We found no incidence in those subjects who eat blue fish daily. As for vegetable intake, our study reflects a lower CC incidence regardless of quantity and frequency. Finally, the intake of olive oil and a low CC incidence are quantifiable in this study.

The most complex justifying explanations in our study would be how relatives that are not first- or second-degree relatives with cancer have a negative influence on CC developing; this could be accounted for by the interviewees holding back or not knowing the data referring to this variable. It is also difficult to justify how drinking more than 2 litres of water a day is associated with CC. Therefore, subsequent studies could explain this finding by comparing the composition of the waters drunk by subjects, but this matter goes beyond the scope of the current study.

Although our study only seeks evidence on how diet and lifestyle habits may prevent CC, which should be confirmed by prospective studies with a more solid design, our results suggest that primary CC prevention is possible. We estimate that up to 70% of cases could be prevented by moderate changes being made in diet and lifestyle habits. Therefore, the data provided by this and other studies indicate that such guidelines should be considered.

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Received: April 03, 2009 Revised: July 21, 2010 Accepted: July 28, 2010