

THE NUTRITIONAL AND LIFESTYLE HABITS OF THE STUDENTS' POPULATION AT THE UNIVERSITY OF BIHAĆ AND PRESENTS THE RISK FACTORS FOR COLORECTAL CANCER

Suzana JAHIĆ¹, Jasmina CEPIC², Emina MALKIĆ³

¹Biotechnical Faculty, University of Bihać, Luke Marjanovića bb, 77 000, Bihać, Bosnia and Herzegovina

²Public Health Institute of the Una-Sana Canton, Irfana Ljubijankića bb, 77 000, Bihać, Bosnia and Herzegovina

³Veterinary Institute Bihać, Omera Novljanina bb, 77 000, Bihać, Bosnia and Herzegovina

Corresponding author email: suzanajahic2002@gmail.com

Abstract

Colorectal cancer is the second leading cause of death due to malignant diseases in developed countries, and the fourth in the world, despite the fact that this disease can be cured by surgery if the diagnosis is set at an earlier stage. Risk factors include diet, lifestyle, habits and genetic factors. People with the highest risk are those who eat low-fiber foods and many proteins, fat and carbohydrates. People with Chron's disease also fall into a risk group. The aim of this research was to determine the nutritional and lifestyle habits of the students' population and on the basis of the obtained results to determine whether there are risk factors for colorectal cancer in the same population. Our results are showing the presence of a large number of risk factors associated with colon cancer. These are a high prevalence of increased body mass (12%) and obesity (9%), high smoking prevalence (42%), low physical activity level (54% inactive), alcoholic beverages consumption (53% once or more weekly, 3% daily). Among nutritional habits of the studied population of students has noticed a high intake of meat and meat products, and a low intake of fish and fruits and vegetables.

Key words: colorectal cancer, risk factors, students, nutritional habits.

INTRODUCTION

Cancer is one of the leading cause of death over the world, and colorectal cancer there is in the third place of the malignant diseases in the world in the men and women. The incidence of cancer increases with the age of the population, starts at the age of 40th, significantly grows in 50th, and later grows with geometric progression (Marković Bergman, 2015).

According to registered data of the Institute for the public health of the Una-Sana Canton, in the period of 2012-2016, the number of incidences of malignant diseases colorectal cancer were 93 suffering from this illness, 53 men and 43 women (data of the Institute for the public health of the Una-Sana Canton, 115/18). The risk factors associated with etiology to colorectal cancer can be divided into two categories.

The first is the risk factors which can be controlled, and they are in the relationship with nutritional and lifestyle habits, and the second

is the immutable factors such as age and family anamnesis (Banjari & Fako, 2014). Though the risk factors can influence on the development of cancer, most of them don't directly influence the development of cancer. It is very important to note that the nutritional and lifestyle habits overcome the genetic predisposition of the person for the development of colorectal cancer (Johnson et al., 2013).

According to data of the World Cancer Research Fund International (2007), almost one-third adult in the whole world isn't enough physically active. The physical activity protects the human body of the development of colorectal cancer.

Some studies showed that smokers have increased the risk for the mortality causes with colorectal cancer opposite nonsmokers (Leufenks et al., 2011).

There are the shreds of evidence which showed that the summation of the alcoholic beverages increased the risk of the following types of carcinoma: intestine (colorectal),

breast, mouth, pharynx and larynx, esophagus (carcinoma of the lamina cells), liver and stomach.

The persons who consume in average 2 to 4 alcoholic beverages per day, they have 23% more highest risk of colorectal cancer, compared to those who consume less of one alcoholic beverage per day (ASC, 2011).

The students have a bad nutritional habits, because of different obligations, they have the tendency of the skipping some meals, less choice of the food, more often they consume unhealthy food for the snack, and they consume the inadequate meal in terms of nutrition, what can negatively affect on the mental activity and possibility of the learning.

With bad nutritional habits, there are bad lifestyle habits, such as decreasing of the physical activity, the consumption of alcoholic beverages and smoking (Banjari et al., 2011.)

The aim of this work was to establish the nutritional and lifestyle habits of the students' population at the University of Bihać and on the basis of the obtained results, determine which the risk factors there are present for the appearance of colorectal cancer.

MATERIALS AND METHODS

The examination was carried among the students at the University of Bihać during October - December 2018 year.

The experiment included 100 respondents, 46 men, and 54 women. For the purpose of this experiment, it was developed an anonymous questionnaire which consisted of four parts. In the first part of the questionnaire, there were the general characteristics of the students population (age and sex), in the second part, there were the questions about life habits of the students (consumption of water during a day, consumption of alcoholic beverages, smoking, and physical activities), the third part was established on the family anamnesis, and in the fourth part was the nutritional habits of students (for example, the number of meals, the frequency of some food consumption).

The participation in this examination was on a voluntary basis, and before the respondent filled in the questionnaire, he or she was informed about the purpose of this

examination, and they got the instructions for the filling of the questionnaire. Anthropometric data about body mass and height filled the respondents ourselves.

From these data, it was calculating the body mass index (BMI), and regarding obtained results, all respondents were categorized in the four groups following the world standards.

The body mass index was calculated that the body mass of the respondent (kg) divided with the square of the height (m) (Grujić, 2002).

The given results were analyzed by applying the corresponding mathematical-statistical methods, and it was assessed the significance of the obtained results.

The level of significance $p < 0.05$ was used for all comparisons and for the discussion of the obtained results. For comparing the data inside and outside the groups used the Fisher's test. The differences between two independent groups were tested with nonparametric Mann-Whitney U test.

RESULTS AND DISCUSSIONS

The average age of the respondents (Table 1) was 21 years for the women and 22.09 for the men. The range for the men was from 18 to 32 years, and the range for the women was from 18 to 27 years.

Table 1. The average age of the students

Student	n	%	Average ± SD	Range (min.-max.)	p
Male	46	46	22.09 ± 3.02	18-32	0.06015
Female	54	54	21.00 ± 2.33	18-27	

p - Mann-Whitney U test

In Table 2 there are the results of the respondent's body mass index, and in Table 3 there is the distribution of the respondents by categories of the nutritional status in relation to body mass index.

Table 2. Body mass index

Student	n	%	Average ± SD	Range (min-max)	p
Male	46	46	25.15 ± 3.77	17.3-38.7	5.276 x10 ⁻⁵ **
Female	54	54	22.33 ± 2.64	17.3-28.9	

Mann-Whitney U test, ** statistical significance $p = 0.01$

Table 3. Categories of respondents according to body mass index

Category		n		%		%	p
Malnutrition		M	F	M	F	M+F	0.1066
M	F	6	4	13.0	7.4	10	
19.15 ± 1.22	18.15 ± 0.58						
Min. = 17.3	Min. = 17.3						
Max. = 20.5	Max. = 18.6						
Normal body mass		n		%		%	7.171 x10 ⁻⁵ **
M	F	M	F	M	F	M+F	
24.22±1.56	22.1±1.84	24	45	52.2	83.3	69	
Min. = 20.8	Min. = 19.1						
Max. = 26.3	Max. = 25.7						
Increased body mass							n
M	F	M	F	M	F	M+F	
27.34±0.41	27.0±0.36	9	3	19.5	5.5	12	
Min. = 26.2	Min. = 26.6						
Max. = 27.8	Max. = 27.3						
Obesity of 1. degree							n
M	F	M	F	M	F	M+F	
30.66 ± 3.69	28.6 ± 0.42	7	2	13.0	3.7	9	
Min = 27.9	Min = 28.3						
Max = 38.7	Max = 28.9						
Obesity of 2. degree							n
M	F	M	F	M	F	M+F	
38.7	0	1	0	2.17	0	1	

n - number of respondents, M- male, F - female, Mann-Whitney U test

**statistical significance p = 0.01

Table 4. Life habits of respondents

Question	The offered response	n		%		%	P
		M	F	M	F	M+F	
1. How often do you drink coffee?	Never	20	14	43.4	25.9	34	0.18829
	1 to 3 times a day	21	33	45.6	61.1	54	
	More than 3 times a day	5	7	10.9	12.9	12	
2. Do you smoke cigarettes?	Yes	18	24	39.1	44.4	42	0.68546
	No	28	30	60.9	55.5	58	
3. How often do you drink alcohol?	Every day	3	0	6.5	0.0	3	0.04383*
	1 to 3 times a week	27	26	58.7	48.1	53	
	Never	16	28	34.8	51.9	44	
4. How physically active you are?	I am totally inactive	20	34	43.5	63.0	54	0.14065
	I recreate 30 minutes a day for the whole year	17	14	37.0	25.9	31	
	I'm actively involved in sports	9	6	19.5	11.1	15	

n - number of respondents, M-male , F - female, Fischer's exact test, * statistical significance p = 0.05

Table 5. Family history respondents

		n		%		%	P
		M	F	M	F	M+F	
1. Has anyone in the immediate family been suffering from colon cancer?	Yes	2	4	4.3	7.4	6	0.68792
	No	44	50	95.7	92.6	94	
2. Are you on long-term antibiotic therapy?	Yes	1	1	2.2	1.9	2	1.0
	I was	1	2	2.2	3.7	3	
	No	44	51	96.5	94.4	95	
3. Did anyone in your family have, or have the following diseases?	Diabetes	22	20	47.8	37.0	42	0.54268
	Thyroid disease	6	10	13.0	18.5	16	
	Increased blood pressure	20	24	43.5	44.4	44	
	Increased fat in the blood	11	14	23.9	25.9	25	
	Some other form of cancer	3	9	0.07	0.17	12	

n - number of respondents, M-male, F - female, Fischer's exact test

In the first category of the malnutrition persons, there are 13.0% men and 7.4% women, until, in the second category of the normal body mass, there are 52.2% men and 83.3% women. Most of the students have a normal body mass (total 69%), but there is a prevalence of the increased body mass and obesity (12% students have increased body mass, and 9% students have the obesity of first degree). There are 19.5% men with increased in body mass, compared to women (5.5%), while in the 1. degree obesity there are 13.0% of men and 3.7% of women. Increased body mass is an important risk factor for colorectal cancer (Banjari & Fako, 2014). According to Kushi et al. (2006), in the USA, one third from 572,000 carcinoma deaths during the year, can be attributed to nutrition and physical activity, including increased body mass and obesity, and the other deaths were caused by exposure to tobacco products.

54% of students drink coffee 1 to 3 times a day (61.1% women and 45.6% men). 43.4% of men never drink coffee, opposite 25.9% of women (Table 4). With caffeine, coffee contains numerous polyphenols that act as antioxidants. In the case of colon cancer, cafestol and kahweol from coffee can be reducing the risk of illness by reducing the secretion of bile acids into the colon (Naganuma et al., 2007). At the other side, these substances increase the level of serum cholesterol, which is a risk factor for the development of cardiovascular disease (Urgert et al., 1995).

According to the results of this survey, 42% of respondents are an active smoker, with a higher percentage of women smokers, 44.4%, with regard to 39.1% men. Smoking is a significant risk factor for the illness of colorectal cancer (Banjari & Fako, 2014). Smokers have an increased risk of mortality due to colon cancer with regard to non-smokers (Leufkens et al., 2001; Colorectal cancer, 2008).

According to the results of these surveys, 6.5% men drink alcohol every day, however, a large percentage of people who consume alcohol once or three times a week have been recorded (58.7% men and 48.1% women). Men are more likely to consume alcohol than women. Colić Barić et al. (2003) points out that the higher

percentage of men who consume alcohol and strong alcoholic drinks more often than women.

Regard to physical activity, the conclusion is that students are inactive, as many as 63.0% of women and 43.5% of men (both 54%) is totally physically inactive. Physiological characteristics, such as obesity, decreased physical activity and increased body mass index (BMI) can increase the risk of colorectal cancer. Healthy body weight, physical activity, and proper nutrition reduce the risk of cancer. With a change in lifestyle, the risk of colon cancer can be reduced by as much as 60-80%. Physical inactivity may also be one of the causes of a weaker bowel discharge, and thus increases an exposure time of the organism to potentially toxic metabolites, which also represents one of the risk factors for the appearance of colon cancer (Cummings & Bingham, 1998; Banjari & Fako, 2014). A positive family history of colorectal cancer was found in 4.3% of men and 7.4% of women (6% both) (Table 5). However, we do not ignore the high incidence of diseases that have been associated with studies with an increased risk for colon carcinoma, such as diabetes (47.8% men and 37% women; 42% both), high blood pressure 44% both respondents. Also, inflammatory bowel disease poses a risk for colon cancer (Johnson et al., 2013).

90% of established cases of colon cancer are in direct connection with nutritional habits (Banjari & Fako, 2014). The results of this research shown in Table 6, show that one meal daily eats 6% of respondents, then 2 to 4 meals a day consumed 80% of respondents, and 5 and more meals daily consume 14% of respondents. The home-cooked meal is most commonly consumed by 84% of students. Men (10.9%) less consume fast food than women (16.7%).

According to the results of this survey, the conclusion is that students have a lower daily intake of water than the recommended amount, 2300-2700 grams of water per day (Grujić, 2000). 62% of students drink 0.5 to 1.0 L water a day, women 70.4%, and man 52.2%. 32% both of students drink recommended amount 2 to 3 L water a day, 39.1% men, and 25.9% women.

Table 6. Nutritional habits of respondents

		n		%		p	
		M	F	M	F		M+F
1. How many meals do you consume during the day?	5 and more	8	6	17.4	11.1	14	0.37835
	2 - 4	34	46	73.9	85.2	80	
	1	4	2	8.7	3.7	6	
2. What do you eat most often?	A homemade meal	39	45	84.8	83.3	84	0.22998
	Bakery, Fast food	5	9	10.9	16.7	14	
	Restaurants	2	0	4.3	0.0	2	
3. How often do you eat fast food?	1 or more times a day	11	5	23.9	9.2	16	0.14812
	Up to 5 times a week	28	40	60.9	74.1	68	
	Never	7	9	15.2	16.7	16	
4. How much water do you drink during the day?	0,5 - 1,0 L	24	38	52.2	70.4	62	0.14851
	2,0 - 3,0 L	18	14	39.1	25.9	32	
	More than 3 L	4	2	8.7	3.7	6	
5. How often do you eat fermented dairy products?	1 to 2 times a day	17	20	37.0	55.6	37	0.00112**
	Up to 5 times a week	28	16	56.5	29.6	42	
	Never	3	18	6.5	14.8	21	
6. How often do you eat fresh fruits?	1 to 2 times a day	18	28	39.1	51.9	46	0.44346
	Up to 5 times a week	25	24	54.3	44.4	49	
	Never	3	2	6.6	3.7	5	
7. How often do you eat vegetables?	1 to 2 times a day	15	15	32.6	27.8	30	0.79858
	Up to 5 times a week	24	28	52.2	51.8	52	
	Never	7	11	15.2	20.4	18	
8. How often do you eat fresh vegetables in the form of salads?	1 to 2 times a day	18	16	39.1	29.6	34	0.32631
	Up to 5 times a week	22	25	47.8	46.3	47	
	Never	6	13	13.1	24.1	19	
9. How often do you eat potatoes?	1 to 2 times a day	9	11	19.6	20.4	20	1.0
	Up to 5 times a week	35	41	76.1	75.9	76	
	Never	2	2	4.3	3.7	4	
10. How often do you eat meat?	1 to 2 times a day	13	15	28.3	27.8	28	1.0
	Up to 5 times a week	33	38	71.7	70.4	71	
	Never	0	1	0.0	1.8	1	
11. How often do you eat pate, chicken, salami, etc?	1 to 2 times a day	15	14	32.6	25.9	29	0.28108
	Up to 5 times a week	21	33	45.6	61.1	54	
	Never	10	7	21.8	13.0	17	
12. How often do you eat fish and/or sea fruits?	1 time a day	5	3	10.9	5.6	8	0.03408*
	2 to 3 times a week	18	35	39.1	64.8	54	
	Never	23	16	50.0	29.6	39	

n - number of respondents, M-male, F - female, Fischer's exact test, *statistical significance $p = 0.05$

**statistical significance $p = 0.01$

According to the results of the frequency of consuming fermented dairy products, it was found that 14.8% of women never consumed this type of product, also 6.5% of men.

The components in dairy products that protectively affect against colon cancer include calcium and vitamin D (World Cancer Research Fund, 2007). Specific cultures of lactic acid bacteria which used in the fermentation of milk, fall into antimutagenic and anticarcinogenic substances (Strnad & Babuš, 1997). Fermented dairy products contain *Lactobacillus* strains that produce lactic acid. Some studies suggest that probiotics produce short-chain fatty acids in the colon, which can reduce the content of the pro-carcinogenic enzymes (Divisi et al., 2006).

18% of respondents (20.4% of women and 15.2% of men) never consume vegetables, and 19% are never consumed fresh vegetables in the form of salads. 49% of respondents

consume fruit up to 5 times per week, and 46% of total respondents consume fruits 1 to 2 times a day. On the other side, fruits are more consumed than vegetables (only 5% of the total number of respondents never eats fruits). Low intake of vegetables, ie. vitamins, and minerals, as well as dietary fiber, is associated with increased risk for colon cancer (Banjari & Fako, 2014).

The components of fruit, that can provide the protective role of colon cancer are carotenoids, vitamin C, flavonoids, isothiocyanates and glucosinolates (Turner et al., 2004). A diet rich in red meat, and poor in fruits and vegetables increases the risk of developing colon cancer.

Flavonoids there are in citrus fruits, apples, onions, green leafy spices (celery, parsley, and nuts), teas, black wine, soy, cherry, strawberries. Polyphenols may have anti-inflammatory, antiallergic and anticancer activity (Jakobek et al., 2008).

Nutrition rich in vegetables, especially cauliflower, broccoli, apricot and cabbage (*Brassicaceae* family), tomato and legumes, suggests a preventative effect from the development of digestive system cancer. Vegetables from a *Brassicaceae* family is rich in nutritional carotenoids, vitamins C, E and K, minerals and dietary fiber (Marti et al., 2016.) 71% of respondents consume meat up to 5 times per week. 28% consume meat once or twice a day, and never consumes only 1.8% of women. Other meat products (pate, salami, etc.) are also often consumed. It has been shown, that is approximately 15% to 20% greater risk of colon cancer by consuming 100 grams of red meat, or 50 grams of processed meat per day.

CONCLUSIONS

The nutritional state of the students' population of the University of Bihać with regard to lifestyle and nutrition indicates a negative trend in the form of increase of body mass. 12% of respondents have increased body mass, and 9% show the obesity of the first degree.

The prevalence of increased body mass in the population of students can be considered as a significant risk factor for colon cancer, in particular in male patients.

The living habits of the students show negative results such as high percentage of coffee consumption, a high percentage of cigarettes and alcohol consumption, and lack of physical activity. Among respondents, 54% consumed coffee once or three times a day, 42% of respondents are smokers, and 3% of students consume alcohol every day, while 53% of those who consume it once, or more than once a week. Regard to the exercise of physical activity, it was found that 54% of students were totally inactive.

Most of the surveyed students have a positive family history that manifests itself or in the diseases involved in the development of colon cancer (eg. elevated blood pressure 44% of respondents, fat in the blood 25% of respondents), or colon cancer (6% of respondents).

Bad nutritional habits were identified among the examinees, which is one of the major risks of colon cancer. Consumption of pate, salami, and similar products on a daily basis was

recorded in 29% of students; 71% of students consume meat five times a week, fast food consumed once or more times during the day by 16% of students.

In order to avoid the increased risk of colon cancer, it is necessary to follow the recommended preventive steps in everyday life: limit the intake of red meat to 500 grams a week, increases the intake of fruits and vegetables, as well as whole grains and legumes.

REFERENCES

- American Cancer Society: Colorectal Cancer Facts & Figures 2011-2013. American Cancer Society, Atlanta, Georgia, Retrieved March 15, 2018, from: www.cancer.org/content/dam/cancer.org/research/cancer-facts-and-statistics/colorectal-cancer-facts-and-figures/colorectal-cancer-facts-and-figures-2011-2013.pdf
- Banjari, I., Kenjerić, D., Mandić, M. L., Nedeljko, M. (2011). Is fad diet a quick fix? An observational study in a Croatian student group. *Periodicum Biologorum*, 13(3), 377–381.
- Banjari, I., Fako, J. (2014). The importance of an up-to-date evidence based diet planning for colorectal cancer patients. *Archive of Oncology*, 21(3-4): 173–175.
- Clinical colorectal cancer: 2008 - the year in review. *Clin. colorectal cancer* (2009), 8(1), 9–10.
- Colić Barić, I., Satalić, Z., Lukesić, Z. (2003). Nutritive value of meals, dietary habits and nutritive status in Croatian university students according to gender. *International Journal of Food Sciences and Nutrition*, 54, 473–484.
- Cummings, J. H., Bingham, S. A. (1998). Diet and the prevention of cancer. *British Medical Journal*, 317, 1636–1640.
- Divisi, D., Di Tommaso, S., Salvemini, S., Garramone, M., Crisci, R. (2006). Diet and cancer. *Acta Biomed.*, 77(2), 118–123.
- Grujić, R. (2000). Nauka o ishrani čovjeka. Tehnološki fakultet, Banja Luka.
- Jakobek, L., Šeruga, M., Novak, I. (2008). Antioksidacijska aktivnost polifenola iz borovnice i jagode. *Pomologia Croatica*, 14(1), 13–26.
- Johnson, C. M., Wei, C., Ensor, J. E., Smolenski, D. J., Amos, C. I., Levin, B. et al. (2013). Meta-analyses of colorectal cancer risk factors. *Cancer Causes Control*, 24(6), 1207–1222.
- Leufkens, A. M., van Duijnhoven, F. J. B., Siersema, P. D., Boshuizen, H. C., Vrieling, A., Agudo, A. (2011). Cigarette smoking and colorectal cancer risk in the European prospective investigation into cancer and nutrition study. *Clinical Gastroenterology and Hepatology*, 9, 137–144.
- Kushi, L. H., Byers, T., Doyle, C., Bandera, E. V., McCullough, M., Gansler, T., Andrews, K. S., Thun, M. J. (2006). American Cancer Society guidelines on nutrition and physical activity for cancer prevention:

- reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer Journal for Clinicians*, 62, 254–281.
- Marković Bergman, B. (2015). Prevencija i rano otkrivanje karcinoma debelog crijeva. *Acta Med. Croatica*, 69, 365–371.
- Martí, R., Roselló, S., Cebolla-Cornejo, J. (2016). Tomato as a source of carotenoids and polyphenols targeted to cancer prevention. *Cancers (Basel)*, 8(6), 1–28.
- Naganuma, T., Kuriyama, S., Akhter, M. et al. (2007). Coffee consumption and the risk of colorectal cancer: A prospective cohort study in Japan. *Int. J. Cancer*, 12,(7): 1542–1547.
- Pham, N. M., Mizoue, T., Tanaka, K. et al. (2013). Fish consumption and colorectal cancer risk: An evaluation based on a systematic review of epidemiologic evidence among the Japanese population. *Jpn. J. Clin. Oncol.*, 43(9), 935–941.
- Podaci Zavoda za javno zdravstvo Unsko-Sanskog kantona, broj 115/18 od 23.01.2018.god.
- Strnad, M., Babuš, V. (1997). Antitumorsko djelovanje fermentiranih mliječnih proizvoda. *Mljekarstvo*, 47(3), 201–207.
- Turner, F., Smith, G., Sachse, C. et al. (2004). Vegetable, fruit and meat consumption and potential risk modifying genes in relation to colorectal cancer. *Int. J. Cancer*, 112(2), 259–264.
- Urgert, R., Schulz, A. G., Katan, M. B. (1995). Effects of cafestol and kahweol from coffee grounds on serum lipids and serum liver enzymes in humans. *Am J Clin Nutr.*, 61(1), 149–154.
- World Cancer Research Fund (2007). Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective. *The American Institute for Cancer Research* 2009, Retrieved September 3, 2018 from www.wcrf.org.