

Colorectal Cancer and Prevention Program focused on Colonoscopy

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Original Article

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Abstract:

Introduction: The article deals with the importance of prevention in the case of colorectal cancer and subsequent radiotherapy

Objective: The objective is to highlight the importance of colorectal cancer prevention focused on colonoscopy

Research sample group and methodology: The research sample group consisted of 3,051 respondents who underwent a colonoscopy examination in the period of 2017-2022 for preventive or diagnostic purposes. The obtained data were processed in the STATISTICA program.

Results: Within the studied set, during colonoscopy, diagnostic examinations were performed more often than preventive examinations - in 2,301 respondents, which represents 74.50%. Furthermore, we found that age is related to the diseases the respondents suffer from. According to the age at the time of the examination, more patients were over 50 (82%), mainly due to a screening that is indicated for people of this age group. During preventive Colonoscopies, 290 cases of polyps were diagnosed, which is 39.2% of all findings. The next most frequent finding during prevention were haemorrhoids, representing 32.6.

Conclusion: Participation in colonoscopy examinations for the year 2020-2021 decreased by up to 13.00% compared to the previous period due to the impact of the Covid pandemic. The impact of neglecting preventive examinations, according to experts, may be manifested in the next few years by a higher growth in the number of patients with colorectal cancer in an advanced stage of the disease, and it is important to point out the significance of colorectal cancer prevention focused on colonoscopy.

Introduction

Tumours are one of the most common and severe diseases today. 11 million new cases of cancer occur and 7 million sufferers of this insidious disease die every year. According to statistics, cancer affects more than a third of the population in developed countries and is the cause of more than 20% of all deaths. The number of deaths related to cancer will probably be higher than deaths due to cardiovascular diseases, which so far have prevailed (1). One of the reasons for the increase in the incidence of cancer is the increase in the average length of life. Currently, approximately half of all cancers occur in people aged 65 and over (2).

Colorectal cancer (CRC) currently represents a serious epidemiological problem in terms of morbidity and mortality of this oncological disease in the Slovak population. To this fact also responds an implemented National Oncology Program of the Slovak Republic, which since 2019 includes population screening for CRC in people between 50 and 70 years of age, with the aim of improving control, secondary prevention and follow-up treatment of this cancer (3). Colorectal cancer is a multifactorial disease affecting the colon and rectum. It is a malignant tumour disease that arises from the malignant transformation of the cylindrical epithelium of the colon and rectum. Nine out of

ten malignant colorectal tumours are preceded by a benign adenoma, which is considered a precancerous condition. According to estimates by the International Agency for Research on Cancer (IARC), in 2015, colorectal cancer was the third most common malignancy in men and the second most common in women worldwide (4). From the latest data on the incidence of malignant tumours in Slovakia, malignant tumours of the colorectum in men represent a significant and currently dominant location. In women, the occurrence of colorectal cancer is in second place (after malignant breast tumours), but its incidence shows an upward trend. The exact cause of colorectal cancer is unknown, but several risk factors are known. Based on what is known so far, it is assumed that colon and rectal cancer arises from a complex interaction between endogenous factors and environmental factors (5). Internal (endogenous) factors include genetic factors and predisposing factors (6). In terms of hereditary factors, people with hereditary non-polyposis colon cancer, people with familial adenomatous polyposis, and people with hamartomatous polyps in the small and large intestine have an increased risk of developing colorectal cancer. Predisposing factors include age (the disease is significantly more common in people over 50), gender (incidence of colorectal cancer is higher in men, while rectal cancer predomi-

nates in them, colon cancer is more common in women), positive family or personal history, non-specific inflammation of the large intestine (especially ulcerative colitis, Crohn's disease), implantation of ureters into the large intestine and rectum, radiotherapy applied in neoplastic processes in the small pelvis, the presence of Barrett's esophagus. A relationship between diabetes mellitus and an increased risk of colorectal cancer in men and women was also found. The external etiological factors of colorectal cancer include lifestyle factors, which include: food (its qualitative and quantitative composition), smoking, alcohol consumption, physical activity, obesity. Environmental factors can have not only an aggressive, tumorigenic effect, but also a protective one. In recent years, epidemiological and experimental studies have convincingly demonstrated a significant relationship between nutrition (improper diet) and colorectal cancer. A high intake of fats (mainly animal fats), increased consumption of meat (mainly red and processed with unsuitable technologies), higher caloric intake (often associated with obesity, hyperglycaemia and hyperinsulinism), reduced intake of fibre and low intake of micronutrients (vitamins and minerals) are considered the decisive factors in increasing the incidence of colorectal cancer. There is also an increased risk of colorectal cancer in smokers and alcohol consumers. Lack of physical activity is also included among the risk factors of colorectal cancer. Adherence to a healthy lifestyle - which we refer to as a set of voluntary human activities, reactions to external stimuli, behaviour in various life situations, a way of solving problems, but also satisfying personal needs, which are based on individual choices from various options - also play a role. The main principles of a healthy lifestyle include varied and balanced diet, an appropriate choice of exercise, avoiding smoking, using harmful substances or drinking alcohol. One should have good quality sleep, optimism and good mood, avoid stress and have regular rest. It cannot be said that there is a single correct guide for following a healthy lifestyle; the needs and possibilities of each individual are different. Therefore, it is necessary to assess a healthy lifestyle especially with regard to the physical and mental condition, age, gender and health status of the person (7).

Interest in a healthy lifestyle (healthy eating, stress prevention, active participation in screening programs, common physical activities) is a good starting point for creating a community. Community activities represent a flexible and at the same time effective way of implementing primary prevention in its everyday form (8).

Protective factors include sufficient amount of fibre in one's diet, calcium, vitamin D, acetylsalicylic acid, non-steroidal anti-inflammatory drugs and the composition of the bacterial intestinal microflora. The age factor is very prominent in the epidemiology of colorectal cancer as a basic (endogenous) risk factor. Colonoscopy is one of the options for the prevention and diagnosis of colorectal cancer. 1. Preventive colonoscopy. It is a broader term to denote a colonoscopy performed for preventive reasons to detect CRC or its precursors. 2. Screening colonoscopy. It is a narrower term to denote a preventive colonoscopy performed for preventive reasons in insured persons who have been found to have a positive test for occult bleeding in the stool. 3. Primary screening colonoscopy. It is a narrower term to denote a preventive colonoscopy, which is performed in patients over 50 years of age on the basis of law. 4. Diagnostic colonoscopy. It is a colonoscopy indicated by a physician to clarify the signs and symptoms that could indicate colon disease in patient. Distinguishing these concepts is important from the point of view of statistical processing, because they represent different groups which, after processing, provide statistically significant differences.

Research sample group and methodology

In this retrospective cohort study, a database containing records of patients who underwent colonoscopy in the period 2017-2022 for preventive or diagnostic purposes was used. We used descriptive and analytical statistics to process and analyse the obtained data. The statistical processing itself was carried out by algorithms found in the STATISTICA and MS Excel applications. To verify the hypothesis, we used the chi²-test (chi-square test of independence). When testing hypotheses, we also present p-values. We tested the hypotheses at the significance level of $p = 0.05$. The basic set for the questionnaire consisted of residents of towns and villages in the Slovak Republic.

Results

The research sample group consisted of 3,051 respondents who met the following inclusion criteria: age 18 and over, gender: male, female, completed colonoscopy examination. Out of the total number, there were 1,545 women (51%) and 1,506 (49%) men. The highest completed education was: 9.97% of respondents finished elementary school, 32.01% had secondary school without school leaving examination, 43.32% of respondents finished a secondary school with school leaving examination and 14.69% of respondents had university education. The group consisted of 50.67% respondents living in towns and cities and 49.33% respondents living in villages. Respondents were from all Slovak regions, while the largest number of respondents, 39.17%, was from the Žilina region. The patients were classified into individual intervals according to the year of birth (picture no. 9) and also the age at the time of the examination. The most represented interval is the year of birth 1940-1950, the number of examined patients was 985 (32% of the total number). The least represented group is the year of birth 2000-2010, from which only 2 patients were examined. In this case, the median is 1955. The average year of birth of the patients is 1955. According to the age at the time of examination, more patients were over 50 (82%), mainly due to the screening, which is indicated for people of this age group. The youngest patient in the studied group was 18 years old, the oldest was 95 years old. The performed examinations were

divided into two basic groups, preventive and diagnostic (table 1). Preventive examinations are those when the patient is asymptomatic, i.e. does not come with any problems or symptoms of colorectal disease. These patients came for examination most often at a request of the health insurance company, general practitioner or gynaecologist. Diagnostic tests are performed in patients who are symptomatic.

More diagnostic examinations were performed within the examined group, total of 2,311, which represents 76%. 740 preventive colonoscopies were performed (24% of the total number of performed colonoscopy examinations). From the resulting data, it is clear that diagnostic colonoscopy prevails over preventive colonoscopy. The results of the performed colonoscopies were classified into groups according to the most frequent findings.

In Table 1, two distinct groups of diseases were represented, namely polyps and haemorrhoids. With a slight predominance, there are more findings of haemorrhoids ($n = 1013$; 33.2%) than polyps ($n = 985$; 32.3%). 57 CRCs were found in the examined file, which represent 1.9% of all findings. The least represented group are lipomas ($n = 5$; 0.2%). Other findings include e.g. oxyuriasis, proctitis, granuloma and post-radiation changes.

The main results of this research are findings in preventive and diagnostic colonoscopies. Since the numbers of polyps are high in both types of colonoscopies, it is clear that prevention is very important. Even if the polyps are benign formations, if they are not removed, they will transform into malignant ones, and thus the initial stage of colorectal cancer will occur. Polyps should therefore be removed as soon as possible. The patient remains monitored, there are regular check-ups. During preventive colonoscopies, 290 cases of polyps were found, which is 39.2% of all findings. The polyp is also the

Table 1 Type of colonoscopy examination

	colonoscopy examination		
	preventive	diagnostic	total
Total	750	2301	3051

Table 2 Individual types of diseases among respondents

Type of disease	Individual types of diseases							total
	Polyps	Haemorrhoids	Diverticula	Tumours	Ulcerative colitis	normal finding	other diseases	
Total	985	1013	351	57	69	540	36	3051

most common finding in preventive colonoscopies. For this reason, prevention is very important to partially prevent the development of colon cancer. The next most frequent findings during prevention were haemorrhoids (n = 241). Haemorrhoids account for 32.6%, i.e., their incidence does not differ by that much compared to polyps. There were also diverticula in a significantly smaller number (n = 76; 10.3%). As part of the preventive examination, 8 tumours were diagnosed (which represents only 1.1%), 9 cases of ulcerative colitis (1.2%), and 3 lipomas (0.4%). Only 15.3% of patients (n = 113 patients out of 740) had a normal finding, which is clear evidence of the importance of prevention.

During diagnostic colonoscopies, haemorrhoids (n = 772; 33.4%) slightly predominated over polyps (n = 695; 30.1%). Diverticula (n = 275; 11.9%) were also abundantly represented. During diagnostic colonoscopies, 49 tumours (2.1%), 60 cases of ulcerative colitis (2.6%), 5 cases of Crohn's disease (0.2%), 2 lipomas (0.1%) were found. 18.5% of patients (n= 427) from a total of 2,311 respondents had normal findings.

Hypothesis 1

The age of the respondents is related to the disease they suffer from.

In hypothesis 1, based on the demographic item, we evaluated the age of the respondents with the respondents' disease. We investigated whether there is a statistically significant difference in the diseases the respondents suffer from depending on their gender.

Hypothesis 1 was tested on the basis of the identification item - the ages of the respondents and the questionnaire item in which the addressed respondents expressed which disease they suffer from. The number of degrees of freedom $df = 24$, and the marginal Chi-square at the chosen significance is 9.49. Since the calculated Chi-square value is higher ($\chi^2 = 615.809102$) and the calculated probability $p = 1.164E-114$ is lower than the chosen significance of 0.05, we claim that we have enough evidence to reject the null hypothesis. We therefore claim that the age of the respondents is related to the disease they suffer from.

Table 3 Observed values of the respondents' diseases in relation to their age

observed frequency	Diseases of the respondents							
	Polyps	Haemorrhoids	Diverticula	Tumours	Ulcerative colitis	normal finding	other diseases	Total
Age of the respondents								
18 – 33 years	7	8	8	1	7	23	10	64
34 - 53 years	124	67	53	6	13	119	6	388
54 - 73 years	214	628	143	22	26	234	6	1273
74 - 83 years	486	213	113	21	22	123	7	985
84 and over	154	97	34	7	1	41	7	341
total	985	1013	351	57	69	540	36	3051

Hypothesis 2

The gender of the respondents is related to the disease they suffer from.

According to the tables, the Chi-square limit at the chosen significance and the calculated degrees of freedom is 36.42. In our case, the calculated Chi-square ($\chi^2 = 446.0400725$) is greater

than the table value of df. The calculated p value of 3.49286E-93 is well below the chosen significance of 0.05. Based on the testing results we can reject the null hypothesis and accept the alternative hypothesis. This means that the disease of the respondents is different depending on the gender.

Table 4 Expected values of the respondents' diseases in relation to their age

expected frequency	Diseases of the respondents							
Age of the respondents	Polyps	Haemorrhoids	Diverticula	Tumours	Ulcerative colitis	normal finding	other diseases	Total
18 - 33 years	20,6621	21,2494	7,36283	1,19567	1,44739	11,327433	0,75516	64
34 - 53 years	125,264	128,825	44,6372	7,24877	8,77483	68,672566	4,57817	388
54 - 73 years	410,982	422,664	146,451	23,7826	28,7896	225,30973	15,0206	1273
74 - 83 years	318,002	327,042	113,319	18,4021	22,2763	174,33628	11,6224	985
84 and over	110,09	113,2196	39,23009	6,37069	7,71189	60,353982	4,02359	341
total	985	1013	351	57	69	540	36	3051

Table 5 Observed values of the respondents' diseases in relation to gender

observed frequency	Diseases of the respondents							
gender of respondents	Polyps	Haemorrhoids	Diverticula	Tumours	Ulcerative colitis	normal finding	other diseases	total
female	344	746	223	18	18	170	26	1545
male	641	267	128	39	51	370	10	1506
total	985	1013	351	57	69	540	36	3051

Table 6 Expected values of the respondents' diseases in relation to gender

expected frequency	Diseases of the respondents							
gender of respondents	Polyps	Haemorrhoids	Diverticula	Tumours	Ulcerative colitis	normal finding	other diseases	Total
female	498,795	512,974	177,743	28,8643	34,941	273,451327	18,23009	1545
male	486,205	500,026	173,257	28,1357	34,059	266,548673	17,76991	1506
total	985	1013	351	57	69	540	36	3051

Hypothesis 3

Completion of preventive examinations has an impact on early diagnosis of the disease among respondents.

The performed examinations were divided into two basic groups, preventive and diagnostic. Preventive examinations are those when the patient is asymptomatic, i.e. does not come with any problems or symptoms of colorectal disease. These patients came for examination most often at a request of the health insurance company, general practitioner or gynaecologist. We also consider it a preventive colonoscopy when the patient has a positive TOKS, but is asymptomatic. Diagnostic tests are performed in patients who are symptomatic.

More diagnostic examinations were performed within the examined group, in total of 2,301 respondents, which represents 74,50 %. Preventive colonoscopies were performed in 760 (25,50 %) of respondents. From the resulting data, it is clear that diagnostic colonoscopy prevails over preventive colonoscopy. In the last hypothesis, we investigated whether the completion of preventive examinations has an impact on the early diagnosis of the respondents' disease.

Table 7 Observed values of colonoscopy examinations and respondents' disease

Observed frequency	colonoscopy examination		
	preventive	diagnostic	Total
disease	691	1820	2511
Normal finding	59	481	540
total	750	2301	3051

Table 8 Expected values of colonoscopy examinations and respondents' disease

Expected frequency	colonoscopy examination		
	diagnostic	diagnostic	Spolu
disease	609,0265487	1901,973451	2511
Normal finding	130,9734513	409,0265487	540
total	750	2301	3051

Due to the calculated chi-square value, we found that there is a connection between the completion of preventive examinations and the early diagnosis of the disease among the respondents. The chi-square value is higher ($\chi^2 = 82.30021$) than the table value for 1 df degree of freedom, which expresses the dependence between the variables. Also, the p value of 1.1691E-19, which is well below the significance level of 0.05, indicates a connection between the individual items.

Discussion

From the available data of the Institute of Health Information and Statistics, the total participation in colonoscopy examinations for 2020 decreased by up to 12%, due to the Covid pandemic. The management of healthcare facilities was not prepared for such pandemic, which implies the need to improve the crisis skills of healthcare managers (9). The impact of neglecting preventive examinations, according to experts, can be manifested in the next few years by a large increase in the number of patients with cancer in an advanced stage.

In their article, Sveen et al. stated that the proportion of carcinomas found in preventive colonoscopies is 3% of all findings. Adenomas were diagnosed in more than a third of the performed preventive examinations. According to data from the journal Gastroenterology, colorectal cancer mortality has decreased by 27% thanks to screening colonoscopies. Our study found that in preventive colonoscopies, cancer was detected in 1.1% of cases. Adenomas accounted for 39.2% of findings (10)

Many people believe that haemorrhoids are mainly related to the older age, around 50 years. According to Sveen, haemorrhoids most often

occur in people aged 45-65, mainly because the connective tissue by the anus weakens. The main cause is also pressure on the anus caused by constipation, diarrhoea, or, e.g. a sedentary profession. In younger women, this is primarily due to pressure on the abdomen during pregnancy, which causes swelling of the veins (10).

The obtained data show that haemorrhoids were the dominant finding in patients under 50 years of age and occurred to a greater extent than in people over 50 years of age. The opposite is the case with diverticula, which clearly dominated in the age group over 50. According to the journal Digestive Diseases, the incidence of diverticula varies greatly worldwide and its prevalence is largely dependent on age. The formation of diverticula in the elderly is primarily due to changes in the resistance of the colon wall, impaired colonic motility, and a lack of fibre (11).

Many articles have debated whether CRC affects one or the other gender more. In our study it was found that men are the more burdened group with CRC. Limam et al. report in their article that there were more men than women with CRC in their study group. CRC was diagnosed in 586 men and 490 women. If this problem is looked at globally, the results of the International Agency for Research on Cancer show a higher incidence of CRC in men (12).

Conclusion

Participation in colonoscopy examinations for the year 2020-2021 decreased by up to 13.00% compared to the previous period due to the impact of the Covid pandemic. The impact of neglecting preventive examinations, according to experts, might manifest in the next few years by a large increase in the number of patients with colorectal cancer in an advanced stage, and it is essential to note the importance of colorectal cancer prevention with a focus on colonoscopy.

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