Primary and secondary prevention of colorectal cancer in the Czech Republic

Kateřina Azeem, Jarmila Ševčíková, Zdeněk Kyselý, Dagmar Horáková, Jana Vlčková, Helena Kollárová

Department of Preventive Medicine, Faculty of Medicine and Dentistry, Palacky University Olomouc, Olomouc, Czech Republic

Prz Gastroenterol 2016; 11 (1): 1–5
DOI: 10.5114/pg.2016.57819

Key words: colorectal cancer, prevention, screening.

Address for correspondence: Helena Kollárová MD, PhD, Department of Preventive Medicine, Faculty of Medicine and Dentistry, Palacky University Olomouc, 3 Hněvotínská St, 77515 Olomouc, Czech Republic, phone: +42 0585632653, e-mail: helena.kollarova@upol.cz

Abstract
Colorectal cancer is one of the most frequent malignancies in the Czech Republic and worldwide. Also, a high prevalence of overweight and obesity, a high proportion of smokers in the population, and one of the highest per capita alcohol consumption rates are typical for the Czech population. The role of general practitioners in the prevention of colorectal cancer is crucial. In primary prevention, the doctor should emphasise the importance of a healthy lifestyle – a balanced diet rich in fruits and vegetables, maintaining a normal body weight, adequate physical activity, and non-smoking. In secondary prevention, patients should be informed about the possibilities of colorectal cancer screening and the benefits of early detection of the disease. Participation rates of the target population for colorectal cancer screening are low. Steps leading to increased participation in colorectal cancer screening (including postal invitations) play an important role in influencing the mortality of colorectal cancer.

Introduction
Colorectal cancer (CRC) is one of the most frequent malignancies in the Czech Republic and worldwide. Every year, approximately 1.36 million people throughout the world develop this type of cancer and nearly 700 thousand people die of it [1]. The Czech Republic is one of the countries with the highest CRC incidence and mortality rates, with more than 8000 people developing the condition and nearly 4000 individuals dying of it each year [2]. Czech males and females rank third and tenth, respectively, in Europe in terms of CRC incidence [1]. Mortality due to CRC has not decreased in spite of better diagnostic and therapeutic options.

Colorectal cancer risk factors as key for primary prevention
Knowledge of colorectal cancer risk factors is crucial for both primary prevention and early detection.

Age
Typically, CRC is an age-related condition. The incidence rates tend to increase after 50 years of age, with a peak in the 65–75 age category [2]. Approximately 20% of all patients are younger than 60 years [3].

Gender
Males are affected by CRC slightly more frequently than females. In 2012, a total of 746,298 males and 614,304 females developed the disease worldwide, with mortality rates of 373,639 and 320,294, respectively [1]. In the Czech Republic, males account for approximately 60% of all patients diagnosed with CRC [4].

Race
In the USA, Afro-Americans have higher incidence rates of CRC than Caucasians (by approximately 22% and 23% for males and females, respectively). Afro-Americans tend to develop CRC at a younger age, often under 50 years [5]. The differences may stem from both biological variations [6, 7] and lower use of health care services due to numerous causes [8].

Nutrition
Nutrition plays a role as a source of energy (and thus a factor influencing body weight) as well as through intake of macro- and micronutrients. Individual food components or their culinary use may modify the risk for development of CRC. Increased fruit and vegetable consumption was found to be a protective factor [9–11].
Excess body weight is a well-known risk factor for CRC. The association between excess body weight and the risk for CRC is somewhat stronger for males than for females and is also stronger for colon cancer than for rectal cancer [11, 20]. For every 10 cm increase in waist circumference, cancer risk increases by 33% and 16% in males and females, respectively [20].

Physical activity

Physical activity is a protective factor against numerous malignancies, including CRC [11, 13, 24]. Physical activity should be an integral part of every individual’s lifestyle, involving at least 30 min of exercise most days of the week.

Smoking

Tobacco smoking is one of the most important risk factors for malignancies including CRC. Smokers have double the risk for adenoma and death from CRC than non-smokers. More intensive screening of current smokers has been considered [20]. Smoking cessation at an older age does not necessarily result in a decrease in the risk for CRC. Therefore, it is necessary to prevent smoking in adolescents and young adults and or to make them stop smoking as soon as possible [20].

Alcohol consumption

Alcohol consumption is a causal factor in the development of CRC, with a dose-effect relationship [20]. The association between alcohol consumption and the risk of CRC is somewhat stronger in males [11].

Health status

The health status factors that are more likely to be linked with the development of CRC include a personal or family history of polyps or sporadic CRCs and adenomatous polyps. Inflammatory bowel diseases such as ulcerative colitis and Crohn’s disease may also play a role. In ulcerative colitis, the risk for CRC is associated with the extent of bowel involvement (the risk for CRC is 5–15 times and 3 times higher in pancolitis and left-sided colitis, respectively) [13].

Other non-modifiable risk factors include genetic predisposition, for instance, hereditary syndromes (familial adenomatous polyposis (FAP) is responsible for less than 1% of CRC cases, and Lynch syndrome or hereditary non-polyposis colorectal cancer (HNPCC) for 3–5% of all adenocarcinomas; FAP and Lynch syndrome are most common, being responsible for a total of approximately 5% of CRC cases) [13].

Diabetes mellitus and insulin resistance have also been associated with CRC. Diabetics have an increased risk of developing CRC [20]. A meta-analysis of 14 studies estimated that in diabetic patients, the risk of CRC was increased by 38% (relative risk (RR) = 1.38, 95% confidence interval (CI) 1.26–1.51) and the risk for rectal cancer by 20% (RR = 1.20, 95% CI: 1.09–1.31) [25]. The observed association may be due to common risk factors such as obesity, low physical activity, nutrition,
or insulin resistance. Studies have also been concerned with the effect of chronic insulin therapy [26].

**Medicines and treatments**  
Prolonged use of aspirin and nonsteroidal anti-inflammatory drugs have been considered as potential protective factors for adenoma, colon cancer, and CRC, with regular use of the drugs being associated with 20% to 40% reduction of the risk. A lower risk for the development of CRC was suggested in a study of hormone replacement therapy in postmenopausal women [13]. Some studies have also indicated protective effects of statins in various types of malignancies, including CRC, but the results have been heterogeneous [13].

A potential effect of androgen deprivation therapy has also been reported, particularly in association with prostate cancer treatment [13], as well as a high risk in patients undergoing cholecystectomy, with some studies suggesting a potential risk in association with right-sided tumours [13].

**Secondary prevention and screening for early detection of CRC**  
In the vast majority of cases, CRC is preceded by adenoma, a clinically detectable precancerous condition gradually developing into cancer. Malignant transformation of adenoma to adenocarcinaoma is a slow process lasting several years (10 years on average). As for the location, CRC (adenocarcinoma in 70% of cases) occurs in the rectum in approximately 60% of cases [27]. In half of patients, the tumour remains clinically silent for a long time. When the diagnosis of CRC is made, one in five patients have already developed metastases, most frequently in the regional lymph nodes, liver, lungs, and peritoneum [13]. Given the long lead time, early detection of precancerous and cancerous lesions contributes to early treatment and better survival. Screening tests performed in at-risk individuals prior to clinical manifestation increase the likelihood of early detection of the condition, better patient prognosis, and savings for the health care system.

In the Czech Republic, the CRC screening program was introduced in 2000. Primary colonoscopy was included in the Czech screening program as of January 2009. In the country, CRC screening comprises the faecal occult blood test (FOBT) and screening colonoscopy. These tests are usually offered during a visit to a general practitioner. To cover a larger part of the population, the FOBT has also been performed by gynaecologists since 2009.

**Faecal occult blood tests**  
At present, the FOBT is no longer linked with a regular check-up (in the past, this was a prerequisite for reimbursement). For practical reasons, however, it is offered as part of a regular check-up. In many cases, however, there is considerable delay as patients tend to provide their stool samples up to several months later, if ever.

Starting from 2009, the FOBT should be carried out annually in the 50–54 years age category; regular check-ups are biannual. After 55 years of age, the FOBT is either performed every 2 years or it may be replaced with screening colonoscopy performed every 10 years if the results are negative. The schedule is the same if CRC screening is performed by gynaecologists.

In spite of the above measures, only a small percentage of people eligible for screening undergo the tests, namely approximately 25%, i.e. about 500,000 tests a year. To make the screening effective, at least 45% (preferably 65%) of the target population should participate [28].

In some countries, CRC screening is outside the competency of general practitioners. In the UK, France, or the Netherlands, for instance, the FOBT kit is mailed to people’s home addresses and the stool samples are mailed to the laboratory. In Poland, a colonoscopy screening program has been introduced.

**Screening colonoscopy**  
Practitioners should offer screening colonoscopy to asymptomatic patients aged 55 years. Screening colonoscopy may only be performed in accredited centres. In case of negative findings, colonoscopy is repeated every 10 years.

**Drawbacks of screening colonoscopy**  
One disadvantage is that the procedure is costly. Moreover, colonoscopy is an invasive method, posing certain risks. One such risk is perforation, occurring in 0.0029–0.72% of cases; fewer than 5 perforations per 10,000 examinations indicate good quality screening. Heavy bleeding occurs in 0.2–2.67% of procedures. Fewer than 50 cases of bleeding per 10,000 examinations indicate good quality screening. The risk of death from colonoscopy is less than 1 per 10,000 examinations. Also, in some cases total colonoscopy cannot be accomplished. Among the most frequent reasons for incomplete colonoscopy are: pain or uncontrolled loops, stricture or obstruction, poor bowel preparation, cardiorespiratory instability, severe colitis or inflammatory bowel disease, and equipment failure [29].

The referring practitioner should be aware of the requirements of the centre performing colonoscopy as far as the preparation and additional examinations are concerned. The patient’s general practitioner must be informed if the patient is referred for colonoscopy by another practitioner.
Patients with normal colonoscopy findings will not undergo the FOBT in the following 10 years. According to the Czech Gastroenterological Society guidelines, colonoscopy is a follow-up method:

- in patients at risk of CRC – a positive family history of HNPCC (or Lynch syndrome) – colonoscopy every 2 years from 25 years of age; if cancer developed in a younger family member, colonoscopy is recommended 5 years earlier than in the youngest family member affected;
- in case of sporadic CRC before 60 years of age colonoscopy every 5 years, the first procedure performed 10 years earlier than detected in an affected family member, or every 3 years if adenoma was detected;
- in case of ulcerative pancolitis lasting for 8 or more years or left-sided colitis lasting for 15 or more years; colonoscopy is recommended every 1–2 years with biopsies to rule out dysplasia.

**Utilisation of CRC screening**

The actual participation of the target population in CRC screening and the willingness to undergo the procedure are low due to the discomfort and fear associated with the current methods. To increase the detection rates, adequate participation of the target population is necessary (currently at only 27%) [30]. However, recommendations on the use of FOBT state that at least 45% (preferably 65%) of the target population should participate to achieve optimal results of this type of screening [28].

In CRC screening, the role of general practitioners is of key importance. Nonetheless, only a small percentage of the target population is screened. This is why the decision was made to involve gynaecologists in CRC screening starting from January 2009. At the moment, they examine only a small proportion of patients undergoing screening, but their involvement is beneficial, making the base of screening in primary care stronger. According to the Czech national reference centre, gynaecologists and general practitioners performed the FOBT in 13.3% and 86.6% of patients, respectively, in 2011, as compared with 6.2% and 93.7% in 2009 and 14.1% and 85.1% in 2010 [28].

It is essential to improve communication between gynaecologists and general practitioners caring for the same patients as well as their sharing of examination results. It must be realised that outpatient gynaecologists have a special position in the Czech health care system as they are involved in all three types of screening programs. Increased participation in screening programs could also be achieved by invitations mailed to patients, as introduced in 2014.

**Conclusions**

The Czech Republic is one of the countries with the highest burden of both cancer and CRC. At the same time, this population is characterised by a high prevalence of excess body weight, high proportion of smokers, and one of the highest per capita alcohol consumption rates. Due to the relatively advanced health care system, there is constantly increasing incidence on the one hand and stagnating mortality on the other hand, mainly resulting from improved therapeutic options, diagnosis, and introduction of organised screening programs.

The benefit of CRC screening as a method leading to a reduction in mortality is limited by low participation of the population in the program. Steps taken to increase participation in screening measures (including the recently introduced postal invitations) play a very important role in affecting CRC mortality.

However, the negative trend in CRC incidence may be effectively influenced through primary prevention (by modifying the exposure to risk factors). The most important primary preventive measures related to CRC are a balanced diet with enough fruit and vegetables, maintaining normal body weight and reducing overweight and obesity, adequate physical activity, non-smoking, and controlled alcohol consumption. The undisputed advantage of primary prevention is that the most important risk factors for CRC are related to numerous other conditions. Thus, their elimination may decrease the incidence of not only CRC but also many other diseases such as cancers or cardiometabolic disorders.

**Acknowledgments**

Supported by the grant project “Effectivity of secondary prevention for cancer in a general practitioner’s office” from the Research Support Foundation, Vaduz.

**Conflict of interest**

The authors declare no conflict of interest.

**References**

1. Ferlay J, Soerjomataram I, Ervik M, et al. GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 [Internet]. Lyon, France: International Agency for Research on Cancer; 2013. Available at: http://globocan.iarc.fr, accessed on 20/02/2015.
2. Dušek L, Mužík J, Kubásek M, et al. Epidemiologie zhoubných nádorů v České republice [online]. Masarykova Univerzita 2005 [cit. 2015–2–20]. Available at: http://www.svod.cz. Verze 7.0 [2007].
3. Dušek L, Mužík J, Malušková D, et al. Epidemiology of cancers with implemented screening programmes in an international comparison. Klin Onkol 2014; 27 Suppl. 2: 40-8.
4. Dušek L, Májek O, Mužík J, et al. Objective need for cancer prevention in the Czech Republic and Europe, and the state thereof. Klin Onkol 2014; 27 Suppl. 2: 7-18.

5. DeSantis C, Naishadham D, Jemal A. Cancer statistics for African Americans, 2013. CA Cancer J Clin 2013; 63: 151-66.

6. Ashktorab H, Paydar M, Namin HH, et al. Prevalence of colorectal neoplasia among young African Americans and Hispanic Americans. Dig Dis Sci 2014; 59: 446-50.

7. Kupfer SS, Anderson JR, Hooker S, et al. Genetic heterogeneity in colorectal cancer associations between African and European Americans. Gastroenterology 2010; 139: 1677-85, 1685. e1-8.

8. Laiyemo AO, Doubeni C, Pinsky PF, et al. Race and colorectal cancer disparities: health-care utilization vs different cancer susceptibilities. J Natl Cancer Inst 2010; 102: 538-46.

9. Kim YI, Mason JB. Nutrition chemoprevention of gastrointestinal cancers: a critical review. Nutr Rev 1996; 54: 259-79.

10. Terry P, Giovannucci E, Michels KB, et al. Fruit, vegetables, dietary fiber, and risk of colorectal cancer. J Natl Cancer Inst 2001; 93: 525-33.

11. Kushi LH, Doyle C, McCullough M, et al. 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 J Clin 2012; 62: 50-67.

12. Tse G, Eslick GD. Cruciferous vegetables and risk of colorectal neoplasms: a systematic review and meta-analysis. Nutr Cancer 2014; 66: 128-39.

13. Ahnen DJ, Macrae FA. Colorectal cancer: epidemiology, risk factors, and protective factors. UpToDate. Available at: http://www.uptodate.com/contents/colorectal-cancer-epidemiology-risk-factors-and-protective-factors?source=search_result&search=colorectal+cancer&selectedTitle=3~150#H26

14. Pericleous M, Mandair D, Caplin ME. Diet and supplements and their impact on colorectal cancer. J Gastrointest Oncol 2013; 4: 409-23.

15. Butler LM, Sinha R, Millikan RC, et al. Heterocyclic amines, meat intake, and association with colon cancer in a population-based study. Am J Epidemiol 2003; 157: 434-45.

16. Chao A, Thun MI, Connell CJ, et al. Meat consumption and risk of colorectal cancer. JAMA 2005; 293: 172-82.

17. Wu S, Feng B, Li K, et al. Fish consumption and colorectal cancer risk in humans: a systematic review and meta-analysis. Am J Med 2012; 125: 551-9.e5.

18. Kimura Y, Kono S, Toyomura K, et al. Meat, fish and fat intake in relation to subsite-specific risk of colorectal cancer: the Fukuoka Colorectal Cancer Study. Cancer Sci 2007; 98: 590-7.

19. Pham NM, Mizoue T, Tanaka K, et al. Meat consumption and colorectal cancer risk: an evaluation based on a systematic review of epidemiologic evidence among the Japanese population. Jpn J Clin Oncol 2014; 44: 641-50.

20. Chan AT, Giovannucci EL. Primary prevention of colorectal cancer. Gastroenterology 2010; 138: 2029-2043.e10.

21. Aune D, Lau R, Chan DS, et al. Dairy products and colorectal cancer risk: a systematic review and meta-analysis of cohort studies. Ann Oncol 2012; 23: 37-45.

22. Wu K, Willett WC, Fuchs CS, et al. Calcium intake and risk of colon cancer in women and men. J Natl Cancer Inst 2002; 94: 437-46.