

Dietary Risk Factors for Colorectal Cancer and Progress in The Application of Dietary Regulation in Treatment

Ziyi Wang^{1, *}

¹ Basis International School Park Lane Harbor, Huizhou, Guangdong, China

*Corresponding author: ziyi.wang14310-biph@basischina.com

Abstract:

rectal cancer, a subtype of colorectal cancer, has a significant incidence rate in both men and women, making it a critical area of study. Understanding the impact of daily dietary intake—including protein, fat, vitamins, and trace elements. The fear surrounding cancer stems from its complexity, variability, and the devastating impact it can have on individuals and their families. Cancer's relentless nature, characterized by the abnormal and unchecked proliferation of cells, underscores the importance of early detection and prevention. The link between unhealthy lifestyle habits and cancer risk underscores the need for individuals to adopt healthier behaviors, such as maintaining a balanced diet, engaging in regular physical activity, and avoiding harmful substances like tobacco and excessive alcohol consumption. This study examines how dietary modifications can reduce the risk of developing Colorectal cancer and their role in supporting treatment, potentially by modulating tumor growth, boosting immune function, and regulating gut flora.

Keywords: Dietary risk factors; dietary regulation; colorectal cancer.

1. Introduction

Colorectal cancer, as the name suggests, is when the cells in the rectum become cancerous, making them unable to function properly. By 2023, the number of cancer patients worldwide has fallen by nearly 33%, and about 4 million people will be able to save their lives from cancer [1]. By far the top 10 most common cancers in men are prostate, lung, colorectal, bladder, skin melanoma, kidney, non-Hodgkin lymphoma, oral cancer, leukemia and pancreatic cancer. The top 10 most common cancers in women include: breast, lung, colorectal, cervical, cutaneous melanoma, non-Hodgkin lymphoma, thyroid tumors, pancreatic, kidney cancer, and leukemia.

Colorectal cancer (CC) is among the top 10 cancers with the highest incidence of cancer in both men and women. The rectum is the part where food is absorbed through the stomach, small intestine, and large intestine, and finally passes through in the form of feces, where the poop comes from when people take dumps [2]. People's daily habits, thus, will have an indelible impact on the rectum and the entire digestive system organs. The main purpose of this essay is to explore the impact of dietary restriction and change on reducing the likelihood of colorectal cancer. By controlling the daily intake of various nutrients, such as protein, fat, vitamins, and certain trace elements, people can ensure the health of various organs of the body, in-

cluding intestinal tissues.

This study will explore the risk factors for Colorectal cancer, including dietary habits and other lifestyle risk factors. In addition, the application of dietary modification in the treatment of Colorectal cancer will be described in detail. Finally, the internal mechanisms of diet will be explored, such as its effect on other parts of the body other than the treatment of Colorectal cancer, its effect on the suppression of other symptoms, and the balance regulation of the number of intestinal floras.

2. Risk Factors Leading to CC in the Long Term of Time

2.1 Lifestyle & Food Habits

The most regular one and most recognizable factor, obviously, is lifestyle and eating habits. The following types of diets could be taken concerns and make quick adjustments to avoid the certain risk of getting CC's.

2.1.1 low fiber diet

Insufficient dietary fiber intake is one of the important risk factors for colorectal cancer. Cellulose can increase the volume of feces and shorten the residence time of feces in the intestine, thereby reducing the contact time between harmful substances and intestinal mucosa and reducing the absorption of carcinogens. In contrast, a low-fiber diet

may lead to constipation and increased exposure to carcinogens in the gut [3].

2.1.2 High-Fat diet

The second factor that can potentially contribute to CC is High-fat, high-protein diet: Long-term intake of high-fat, high-protein foods, especially high-calorie foods such as fried, grilled, and pickled, can increase the risk of colorectal cancer. High-fat diet not only leads to weight gain, but also may promote intestinal epithelial cell proliferation and cancer by promoting bile acid secretion and increasing the concentration of bile acid in the intestine.

2.1.3 Alcohol consumption

The third final food habit is Alcohol intake. Long-term chronic alcohol consumption is also a risk factor for colorectal cancer. Alcohol can be used as a solvent to promote the intestinal absorption of carcinogens, and may directly damage the intestinal mucosa, increasing the risk of cancer.

2.2 Genetic Defects & Complication of Related Organs

Food habits can be adjusted by peoples' actions. The genetic defects, however, cannot be fully accomplished by people's food habits. Genetic factors play an important role in the onset of colorectal cancer. About 10% of colorectal cancer patients have a familial genetic background, mainly including familial adenomatous polyposis (FAP) and hereditary non-polyposis colorectal cancer (HNPCC). Patients with these genetic disorders often carry specific gene mutations that lead to the formation of multiple polyps in the gut, which in turn develop into colorectal cancer [1]. Johns Hopkins University researchers have conducted an extensive study of familial colorectal cancer, including FAP and HNPCC. They have identified specific genetic mutations that cause these diseases and contribute to understanding their genetic patterns and clinical manifestations [2]. Certain problems can sometimes lead to the complication of related organs as well. Inflammatory bowel disease will be a great example of complications. Certain chronic inflammatory bowel diseases, such as ulcerative colitis and Crohn's disease, are also important risk factors for colorectal cancer. These inflammatory diseases exist for a long time, which can lead to repeated damage and repair of intestinal mucosa, and then lead to abnormal cell proliferation and cancer. Clinical studies have shown that patients with inflammatory bowel disease have a significantly higher risk of developing colorectal cancer than the general population. A study published in the World Journal of Gastroenterology in 2014 analyzed the risk of colorectal cancer in patients with IBD. The study found that patients with IBD have a higher risk of

developing colorectal cancer than the general population.

2.3 Age & Gender Difference

The age and gender differences between individuals is also the major risk factor of CC. The incidence of CC increases with age, especially after the age of 40, the incidence rises rapidly. This may be related to the decline in the repair ability of intestinal mucosal cells and the weakening of immune surveillance function with age. In addition, men have a higher risk of CC than women, which may be related to differences in lifestyle habits, dietary habits, and hormone levels. Gastroenterologists and oncologists who specialize in CC frequently comment on the age-related increase in incidence and the gender differences in risk [3]. For example, Dr. Richard Schilsky, a leading oncologist and former Chief Medical Officer of the American Society of Clinical Oncology, has stated in interviews and publications that "the risk of CC increases dramatically with age, particularly after age 50, and men are more likely to develop CC than women, likely due to a combination of genetic, hormonal, and lifestyle factors."

2.4 Obesity

Obesity is another important risk factor for CC. Obesity is often associated with poor eating habits and lack of physical activity, which together promote the development of CC. Moderate physical activity and physical exercise can reduce the risk of CC, which may be related to the ability of exercise to improve the intestinal microenvironment and reduce the production and accumulation of harmful substances in the intestine [4]. The WHO has recognized obesity as a major risk factor for several types of cancer, including CC.

2.5 Smoking

Smoking is one of the risk factors as well. People usually assume that smoking only affects the lungs. Smoking, however, is not only closely associated with respiratory diseases such as lung cancer but also with the onset of CC [5]. Long-term smoking can lead to the accumulation of a variety of harmful substances in the body, which may reach the intestine through the blood circulation, causing damage and irritation to the intestinal mucosa, and then promoting the occurrence of CC. The ACS, a leading authority on cancer research and prevention, states that smoking increases the risk of developing colorectal cancer. They explain that smokers are more likely to develop polyps in the colon, which can progress to cancer over time. The ACS also notes that quitting smoking can reduce the risk of developing many types of cancer, including CC.

The occurrence of CC is the result of multiple factors. To reduce the risk of CC, we should maintain a healthy

lifestyle, eat a reasonable diet, exercise moderately, stop smoking, limit alcohol consumption, have regular medical examinations, and pay attention to whether we have risk factors such as genetic diseases or inflammatory bowel disease. Through comprehensive intervention and early screening, we can effectively prevent and control the occurrence and development of CC.

3. Application of Diet in the Treatment of CC and Mechanism of Diet Regulation

Diet plays a crucial role in the treatment of colorectal cancer (CC). Reasonable diet can not only provide the necessary nutritional support for patients and promote physical recovery, but also directly or indirectly affect the growth, metastasis and treatment effect of tumors through its specific bioactive ingredients. The following will elaborate on the application of diet in CC treatment and its mechanism of action and attach relevant evidence and sources [6].

3.1 Nutritional Support and Rehabilitation

Patients with CC often suffer from malnutrition, weight loss and impaired immune function due to factors such as tumor itself, surgery, radiotherapy and chemotherapy. A balanced diet ensures that patients get enough protein, carbohydrates, fats, vitamins, minerals, and water to maintain weight, boost immunity, promote postoperative recovery, and reduce complications. Multiple studies have shown that malnutrition is one of the important factors for poor prognosis in patients with CC. For example, a systematic review and meta-analysis published in JAMA Oncology found that nutritional support significantly improved survival and quality of life in patients with CC [7].

3.2 Antioxidant and Anti-inflammatory Effects

A diet rich in antioxidants (ex: vitamins C, E, beta-carotene, selenium, etc.) and anti-inflammatory ingredients (ex: Omega-3 fatty acids, curcumin, etc.) can reduce the production of free radicals in the body and inhibit the inflammatory response, thus slowing the growth and spread of tumors. A study published in Nutrition and Cancer showed that people with a high intake of antioxidants had a lower risk of CC [5]. In addition, Omega-3 fatty acids have been identified as potentially beneficial for the prevention and treatment of CC due to their anti-inflammatory properties, a view supported by multiple preclinical and observational studies [6].

3.3 Regulate Intestinal Flora

Intestinal flora is closely related to human health, especially in tumor immunity and metabolic regulation. Dietary regulation, such as increasing the intake of dietary

fiber, can promote the growth of beneficial bacteria and inhibit the reproduction of harmful bacteria, thereby regulating the balance of intestinal flora, affecting the tumor microenvironment, and enhancing immune surveillance and anti-tumor response. In recent years, the relationship between intestinal flora and CC has become a research hotspot. A study published in Nature Medicine found that specific types of gut microbiota are associated with prognosis in patients with CC, and regulating gut microbiota through dietary intervention may become a new treatment strategy [8].

3.4 Target Metabolic Pathways

The growth and proliferation of CC cells depend on specific metabolic pathways, such as glycolysis, fatty acid synthesis, etc. By adjusting the diet, such as reducing the intake of high-sugar and high-fat foods and increasing the intake of foods rich in dietary fiber and anti-cancer components, these metabolic pathways can be interfered with and the growth of tumor cells can be inhibited. The keto-body diet (a high-fat, low-carb eating pattern) has been of concern in CC treatment. Although there are limited clinical studies directly applied to patients with CC, some in vitro experiments and small clinical trials suggest that the ketobody diet may inhibit growth and metastasis of tumor cells by altering their metabolic status [9].

3.5 Psychological Support and Quality of Life

Good eating habits are not only related to physical health, but also have a positive impact on patients' mental state and quality of life. A balanced diet can relieve negative emotions such as anxiety and depression and improve the overall well-being of patients, thereby enhancing their confidence and determination to fight the disease. Although direct evidence in this area is mostly observational studies and patient reports, extensive clinical experience and patient feedback suggest that appropriate dietary interventions can significantly improve the quality of life of patients with CC [10-11].

In summary, the application of diet in CC treatment is multi-faceted, involving nutritional support, antioxidant and anti-inflammatory, regulation of intestinal flora, targeting metabolic pathways and psychological support. Through scientific and reasonable diet regulations, patients can be provided with comprehensive health support, optimize the treatment effect and improve their quality of life.

4. Conclusion

The development of CC is intricate, involving genetics, diseases, age, gender, obesity, and smoking. Comprehending these risks is vital for prevention and early detection.

Adopting a healthy lifestyle—balanced diet, exercise, quitting smoking, and limited alcohol—substantially lowers CC risk. Early screening and check-ups enable effective treatment. Diet aids CC treatment by offering nutrients, potentially modulating tumor growth, and boosting immune function. A holistic approach that integrates lifestyle, screening, and dietary interventions can better prevent CC. Dietary strategies enhance CC management by providing nutrients, supporting immunity, combating inflammation, and regulating gut health. These interventions should be integrated into CC treatment plans alongside conventional therapies. Future research should delve into dietary components' effects on CC to optimize personalized nutrition for better patient outcomes.

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