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Influence of eating habits on gastrointestinal cancer development: a systematic review

Influência dos hábitos alimentares no desenvolvimento do câncer gastrointestinal: uma revisão sistemática

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ABSTRACT

Purpose: Evaluate the influence of eating habits on the development of gastrointestinal cancer. **Methods:** Systematic review in the databases PubMed, VHL, SCIELO, and LILACS, as descriptor terms, indexed in the DeCS and MESH, gastrointestinal neoplasms, gastrointestinal cancer, tumors of the digestive tract, gastrointestinal tumors, stomach cancer, bowel cancer, esophageal cancer, rectal cancer, pancreatic cancer, liver cancer, eating habits, eating behavior, foods, nutrition, cancer, and their respective forms. The systematic review protocol was registered in the PROSPERO with ID CRD42022345625. **Results:** The initial search in the databases yielded 7,126 publications, of which 22 articles underwent analysis. The results indicate that certain dietary patterns, such as high intake of red and processed meat and conditions such as obesity, are associated with a greater risk of developing gastrointestinal cancer, while diets rich in fiber, whole grains, vitamins, and antioxidants, especially the Mediterranean diet, demonstrate a protective effect. **Conclusion:** The eating habits and lifestyle influence cancer development, particularly those related to the gastrointestinal tract.

Keywords: Gastrointestinal cancer; Dietetics; Nutrition;

RESUMO

Objetivo: Avaliar a influência dos hábitos alimentares no desenvolvimento do câncer gastrointestinal. **Métodos:** Revisão sistemática nas bases de dados PubMed, BVS, SCIELO e LILACS, como termos descritores, indexados no DeCS e MESH, neoplasias gastrointestinais, câncer gastrointestinal, tumores do trato digestivo, tumores gastrointestinais, câncer de estômago, câncer de intestino, câncer de esôfago , câncer retal, câncer de pâncreas, câncer de fígado, hábitos alimentares, comportamento alimentar, alimentos, nutrição, câncer e suas respectivas formas. O protocolo de revisão sistemática foi registrado no PROSPERO com ID CRD42022345625. **Resultados:** A busca inicial nas bases de dados resultou em 7.126 publicações, das quais 22 artigos foram analisados. Os resultados indicam que certos padrões alimentares, como o elevado consumo de carne vermelha e processada e condições como a obesidade, estão associados a um maior risco de desenvolvimento de cancro gastrointestinal, enquanto dietas ricas em fibras, cereais integrais, vitaminas e antioxidantes, especialmente os Dieta mediterrânica, demonstram um efeito protetor. **Conclusão:** Os hábitos alimentares e estilo de vida influenciam o desenvolvimento do câncer, principalmente aqueles relacionados ao trato gastrointestinal.

Palavras-chave: Câncer gastrointestinal; Dieta; Nutrição;

INTRODUCTION

Cancer is a collective term for a set of diseases characterized by the uncontrolled proliferation of cells, which have the ability to infect neighboring tissues. The occurrence of this condition is a result of a genetic mutation, specifically the addition or removal of nucleotide bases or the relocation of gene loci. These mutations are responsible for the development of cancer, as they cause changes in the cell's DNA, leading to incorrect instructions for its functioning (Hausman, 2019; Zhang et al., 2021).

Dietary variables play a significant role in the development of many cancerous growths associated with the gastrointestinal tract. The digestive organs are vital for the optimal operation of the human body because they carry out many duties, such as the assimilation and utilization of nutrients (Rafiee et al., 2021). Genetic abnormalities that affect the cell cycle, leading to uncontrolled cell division and abnormal growth, directly influence the development of cancer. Genetic factors have a role in determining the likelihood of developing cancer, but making changes to one's lifestyle choices can also have a beneficial impact on preventing cancer (Moazzen et al., 2022).

Nutrition is an important modifiable risk factor, both through its impact on obesity and through dietary chemical exposures that can increase or decrease cancer risk (Hashemi Madani et al., 2021). Gastrointestinal cancer (GC), which encompasses many organs of the digestive system such as the esophagus, stomach, liver, gallbladder, pancreas, small intestine, large intestine, rectum, and anus, is the most commonly diagnosed form of cancer globally (Kim et al., 2018). Epidemiological studies have shown that consuming diets that are high in fruits and vegetables can lower the risk of developing upper gastrointestinal cancer, such as esophagus and stomach cancer. This is because these foods contain flavonoids, which have chemopreventive properties that regulate various cellular processes, including the cell cycle, cell proliferation, apoptosis, and the metabolism of carcinogens and inflammatory substances. These mechanisms contribute to the observed reduction in cancer risk (Sun et al., 2017).

Consuming foods that are recognized for their antioxidant and anticancer properties, along with adopting good lifestyle practices, can help prevent the development of the disease. Vitamin A and vitamin E, which are antioxidant micronutrients, can help prevent the development of cancer. Vegetables and fruits are

the primary dietary sources of these nutrients. Dietary antioxidants are linked to the prevention of chronic diseases caused by oxidative stress, including specific forms of cancer, such as colorectal cancer (Luo et al., 2019).

Based on this, the study aimed to ascertain the potential impact of dietary choices on the occurrence of gastrointestinal cancer.

METHODOLOGY

The current investigation was conducted using a systematic review methodology. The review procedure was recorded in the international prospective registry of systematic reviews (PROSPERO) with the identification number CRD42022345625.

We developed the review around the guiding question: Do an individual's eating habits influence the development of gastrointestinal cancer? Generated from the PICO strategy:

- P: adult patients diagnosed with cancer;
- I: eating habits;
- C: no gastrointestinal cancer diagnosis;
- O: development of gastrointestinal cancer.

The eligibility criteria encompassed randomized clinical trials, quasi-experimental, cohort, case-control, and cross-sectional studies that were published in English, Portuguese, or Spanish between 2017 and 2022. The publications that were excluded from the study met the following criteria: they were published before 2017, they were duplicates of other articles, they were literature reviews, editorials, case series, or case reports, they focused on children, they did not align with the suggested theme, or they were not written in Portuguese, English, or Spanish.

The databases utilized included PubMed, Virtual Health Library (VHL), Scientific Electronic Library Online (SCIELO), and Scientific and Technical Health Information for Latin America and the Caribbean (LILACS). We utilized the DeCS (Health Sciences Descriptors) index, which encompassed terms such as gastrointestinal neoplasms, gastrointestinal cancer, tumors of the digestive tract, gastrointestinal tumors,

stomach cancer, bowel cancer, esophageal cancer, rectal cancer, pancreatic cancer, liver cancer, eating habits, eating behavior, foods, nutrition, cancer, and its respective forms. The search algorithms were constructed using the boolean operators "AND" and "OR" (Fig. 1).

Figure 1 – Table with the search terms used in the study

Search Terms
("Gastrointestinal neoplasms" OR "Gastrointestinal cancer" OR "Digestive tract tumors" OR "Gastrointestinal tumors" OR "Bowel cancer" OR "Stomach cancer" OR "Esophageal cancer" OR "Rectal cancer") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("Gastrointestinal neoplasms" OR "Digestive tract tumors" OR "Gastrointestinal tumors") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("Gastrointestinal cancer" OR "Bowel cancer" OR "Stomach cancer" OR "Esophageal cancer" OR "Rectal cancer") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("Gastrointestinal neoplasms" OR "digestive tract tumors" OR "gastrointestinal tumors" OR "bowel cancer" OR "stomach cancer" OR "esophageal cancer" OR "rectal cancer" OR "pancreatic cancer" OR "liver cancer" OR "gastrointestinal cancers") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("digestive tract tumors" OR "gastrointestinal tumors" OR "bowel cancer" OR "stomach cancer" OR "esophageal cancer" OR "rectal cancer" OR "pancreatic cancer" OR "liver cancer" OR "gastrointestinal cancers") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("bowel cancer" OR "stomach cancer" OR "esophageal cancer" OR "rectal cancer" OR "pancreatic cancer" OR "liver cancer" OR "gastrointestinal cancers") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("stomach cancer" OR "esophageal cancer" OR "rectal cancer" OR "pancreatic cancer" OR "liver cancer" OR "gastrointestinal cancers") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("esophageal cancer" OR "rectal cancer" OR "pancreatic cancer" OR "liver cancer" OR "gastrointestinal cancers") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("rectal cancer" OR "pancreatic cancer" OR "liver cancer" OR "gastrointestinal cancers") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("pancreatic cancer" OR "liver cancer" OR "gastrointestinal cancers") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("liver cancer" OR "gastrointestinal cancers") AND ("dietary habits" OR "eating behavior" OR "foods" OR "diet")
("dietary habits" OR "eating behavior" OR "foods" OR "diet")

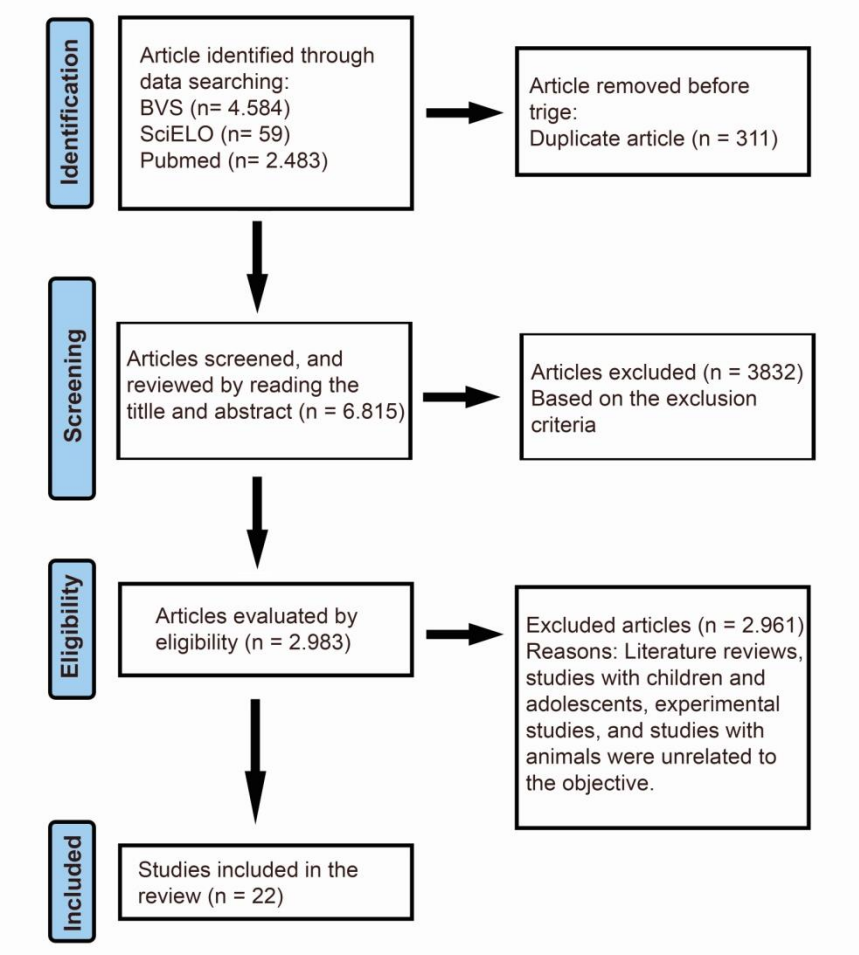
Source: Elaborated by the authors.

Based on the inclusion and exclusion criteria, two researchers independently analyzed the selected articles. Duplicate articles were excluded in the first phase, and titles and abstracts were read individually and blindly. The articles were read in full in the second phase, and the differences in study selection were discussed between both.

RESULTS

The initial search in the databases yielded a total of 7,126 papers, with 4,584 coming from the VHL database, 2,483 from PUBMED, and 59 from SciELO. Prior to topic-based screening, 311 duplicate studies were eliminated. After applying the exclusion criteria, a total of 3,832 studies were eliminated. Ultimately, the entirety of the remaining papers were thoroughly examined, resulting in the exclusion of an additional 2,961 articles. This process left a total of 22 publications for the study, as depicted in Figure 2.

Figure 2 - Identification of studies through database searches



Source: Elaborated by the authors.

The systematic review done assessed the influence of dietary habits on the development of gastrointestinal cancer using the PICO technique. The study encompassed a range of cohort and case-control studies that examined several forms of gastrointestinal malignancies, including colorectal, gastric, pancreatic, esophageal, and biliary tract cancers. Table 1 provides a comprehensive overview of the chosen studies, emphasizing the demographics of the participants, the specific diets examined, and the primary findings obtained. The results of these studies suggest that specific eating habits, such as consuming large amounts of red and processed meat and being overweight, are linked to an increased likelihood of developing gastrointestinal cancer. On the other hand, diets that are high in fiber, whole grains, vitamins, and antioxidants, particularly the Mediterranean diet, appear to have a beneficial effect in preventing this type of cancer.

The examined studies provided varied data about the impact of dietary habits on the progression of gastrointestinal cancer. Various kinds of gastrointestinal cancer, such as colorectal cancer, gastric cancer, pancreatic cancer, esophageal cancer, and biliary tract cancer, were examined in different types of studies, including cohort studies and case-control studies.

There is a strong and continuous link between consuming large amounts of red and processed meat and a higher likelihood of developing colorectal cancer. In a study conducted by Bradbury et al. (2019), it was discovered that individuals who consumed 76 g/day of red and processed meat had a 20% greater likelihood of developing colorectal cancer compared to those who consumed 21 g/day. Deoula et al. (2019) found comparable connections in a Moroccan population, indicating that cancer risk was not linked to processed meat prepared using traditional techniques. Nevertheless, there is a persistent correlation between the consumption of red meat and the occurrence of colorectal and colon cancer.

The effects of pro-inflammatory diets and the Mediterranean diet have been thoroughly investigated. Bodén et al. (2019) demonstrated that consuming a diet high in pro-inflammatory foods was linked to a higher likelihood of developing stomach cancer in men, whereas following a Mediterranean diet had a beneficial effect on preventing it. This dietary pattern involves a significant intake of vegetables, fruits, nuts, and olive oil, while having a limited to moderate intake of dairy products and meat. According to

Cheng et al. (2018), adopting a Mediterranean diet can serve as a preventative measure against cancer development, promoting a better lifestyle.

Research on the consumption of dietary fiber and whole grains has shown that these foods serve as preventive factors against colorectal cancer. In their study, Hullings et al. (2020) found that consuming whole grains, rather than just total fiber, had a substantial impact in lowering the likelihood of developing colorectal cancer. Men who consumed more fiber from cereals and whole grains had a reduced likelihood of developing colorectal câncer (Hu, et.al., 2019).

Excessive consumption of calories and being overweight have been identified as significant risk factors, whereas the consumption of vitamins and antioxidants has a significant impact on lowering risk. Abdelrehim et al. (2018) found a connection between consuming a large amount of calories and being obese, and an increased likelihood of developing pancreatic cancer. Similarly, Hashemi Madani et al. (2021) discovered that higher obesity measurements, such as BMI and waist circumference, were linked to a higher risk of colorectal and gastric cancer in women. In a study conducted by Luo et al. (2019), it was shown that consuming vitamins A and E had a preventive effect against colorectal cancer. Additionally, Rafiee et al. (2021) discovered that the total antioxidant capacity of the diet (TAC) was inversely associated with the risk of colorectal cancer.

Buller et al. (2021) investigated the effects of nitrates and nitrites in the diet and discovered a weak correlation between different sources of dietary nitrite intake and a lower risk of digestive system cancers, particularly those of the biliary tract and esophagus; however, they found no significant correlation between water nitrate and digestive system cancers. Kim et al. (2018) and Sun et al. (2017) conducted studies on flavonoids and carotenoids. They discovered that there were no significant links between flavonoid consumption and the likelihood of developing esophageal or gastric cancer. However, they did find that consuming lycopene had a preventive impact against gastric cancer.

Table 1 - Presentation of selected studies.

Article	Type of study	POPULATION Adult patients diagnosed with gastrointestinal cancer	Dietary habits	OUTCOME
Abdelrehim *et.al.*, 2018	Case-control	75 patients (31 female and 44 male)	Dietary fiber (cereals and whole grains) and total sugars, animal proteins with a low intake of white meat and a high intake of red meat, consumption of fruits and vegetables (with a high intake of dark green vegetables), and high consumption of milk and dairy products (cheese and margarine)	High caloric intake, which is associated with obesity, increases the risk of pancreatic cancer. Fruits and vegetables provide a variety of nutrients and phytochemicals, which have protective mechanisms of action against cancer. Consumption of red meat was not associated with PC development. The high energy intake and low vegetable consumption in Egypt may play a role in increasing the risk of PC.
Bóden,S. *et.al.*, 2019	Prospective cohort	9,250 cancer patients (4420 females and 4830 males)	Greater intake of a pro-inflammatory or less healthy diet and lower consumption of a Mediterranean diet, characterized by vegetables, legumes, fruits, oilseeds, and olive oils; low to moderate consumption of dairy products; and alcoholic beverages and meat.	The two dietary patterns analyzed (pro-inflammatory and Mediterranean diet) were associated with the risk of developing cancer, mainly gastric cancer in men. However, the Mediterranean diet demonstrates a protective factor. Researchers identified obesity as a risk factor associated with body fat levels.
Bradbury,K.E. *et.al.*, 2019	Prospective cohort	2,609 patients with colorectal cancer (1,504 males and 1,105 females)	High consumption of red and processed meat and high alcohol intake. Lower consumption of legumes, vegetables, and fiber.	Participants who reported consuming an average of 76 g/day of red and processed meat, compared to 21 g/day, had a 20% higher risk of colorectal cancer. Participants with the highest consumption of fiber and fiber from bread and breakfast cereals had a 14% lower risk; alcohol was associated with an 8% higher risk for intake greater than 10 g/day; and consumption of fish, poultry, cheese, fruit, vegetables, tea, and coffee were not associated with colorectal cancer risk.

Buller, I,D. *et.al.,* 2021	Prospective cohort	479 cancer patients (female)	Ingestion of nitrate and nitrite of plant and animal origin and nitrate from drinking water.	Researchers found inverse associations between total dietary nitrite intake and biliary tract and gallbladder cancer, and a non-significant positive result with liver cancer. Weak inverse associations have been observed between several sources of dietary nitrite intake and cancers of the digestive system, including plant nitrite and gallbladder cancer, animal nitrite and small intestinal cancer, and processed meat nitrite and esophageal cancer. No significant relationships were observed between water nitrate and digestive system cancers.
Cheng, En., *et.al.,* 2018	Prospective cohort	1731 female patients	Women with a low intake of the Mediterranean diet had a higher consumption of alcohol, proteins, and carbohydrates.	A healthier lifestyle, including foods from the Mediterranean diet, may be associated with a protective factor for cancer development.
Deoula, M.S.,*et.al.,* 2019	Case-control	1,453 patients (716 males and 737 females)	Controls were more likely to consume fiber, dairy products, fruit, fish, calcium, and vegetables; higher total meat consumption among cases than controls, especially processed meat.	Red meat consumption is linked to the development of colon and colorectal cancer. Processed meat prepared using traditional methods was not associated with cancer risk, and the study demonstrated positive associations between poultry consumption and colon cancer risk among men.
Feng, *et.al.,* 2020	Prospective cohort	472 patients	A moderate intake of alcohol and calories from food leads to weight gain.	Research has demonstrated that an increase in BMI can impact cancer development by altering fasting blood glucose levels.
Gunathilake, M. *et.al.,* 2021	Case-control	268 patients (96 female and 172 male)	GC patients had a higher total energy intake than controls and a low fruit intake. There was a high consumption of vegetables and seafood, as well as dairy products, among women.	The risk of cancer may directly correlate with microbial dysbiosis. It has been reported that men with a low dysbiosis index and high consumption of vegetables and seafood have a lower risk of GC, while women with a low dysbiosis index and high dairy consumption have a reduced risk of GC.
Hu, *et.al.,* 2019	Cohort study	3,178 patients (1902 females and 1276 males	Higher consumption of fiber from cereals among men compared to women.	Total fiber intake was not associated with colorectal cancer risk among men and women. In men, a higher fiber intake from cereals and whole grains was associated with a lower risk of CRC. A higher intake of total dietary fiber within the range of an American diet is unlikely to substantially reduce the risk of CRC.

Hullings, A.G., *et.al.,* 2020	Cohort study	10,200 patients (3,488 females and 6,712 males)	Average intake of dietary fiber and whole grains among older people with higher education. Lower intake of red and processed meat and calories.	The intake of whole grains, not total fiber, acts as a protective factor against the development of colorectal cancer.
Júlian-Serrano, S., 2022	Cohort study	3,137 patients (1,149 females and 1,988 males)	Adherence to the Mediterranean diet and healthy lifestyle habits are higher in older individuals with a higher level of education.	Greater adherence to the Mediterranean diet (consumption of fruits and vegetables, less intake of red meat and alcohol) has a protective effect on the development of pancreatic cancer.protetor ao desenvolvimento de câncer de pâncreas.
kim, *et.al.,* 2018	Case-control	415 cases (145 female and 270 male)	Individuals in the case group ingested more energy and less total carotenoids and lycopene than the control group.	Among women, a higher total carotenoid intake was inversely associated with GC risk. And higher lycopene intake for both men and women had a protective effect on the risk of gastric cancer.
Kvaerner, A.S., *et.al.,* 2021	Prospective cohort	1.413 patients	The primary focus of the dietary analyses was on foods and beverages associated with the risk of CRC and its precursor lesions, including the intake of alcohol, red and processed meat, whole grains, foods containing dietary fiber, dairy products, and calcium supplements.	The study was not conclusive.
Luo, H., *et.al.,* 2019	Case-control	535 patients (239 female and 296 male)	The consumption of vitamin A and E, dairy products, and serum retinol levels were lower in the case group compared to the control group. And the intake of red and processed meat was higher in the case group.	Intake of vitamin A and E acts as a protective factor against the development of colorectal cancer. Serum retinol level was not associated with CRC risk.
Hashemi Madani et al. (2021)	Cohort study	933 patients (376 female and 557 male)	Consumption of specific foods such as roasted or salted seeds and black halva is common in a part of Iran with a higher incidence of gastric cancer.	In women, increased obesity measures (BMI, WC, and WHR) were associated with a higher risk of colorectal and gastric cancer. In men, no significant relationship was found.
Mejborn, H., *et.al.,* 2020	Cohort study	282 patients (3249 females and 3033 males)	The consumption of processed meat was greater than that of poultry.	Consumption of red and processed meat did not significantly increase the risk of CRC. If there is a high intake, poultry consumption has demonstrated a high risk.

Moazzen, S. *et.al.*, 2021	Prospective cohort	573 patients (228 female and 345 male)	The case group had a higher calorie intake and lower consumption of a balanced diet with fruits, vegetables, and whole grains.	Consumption of a balanced diet and healthy lifestyle has demonstrated a protective effect against gastrointestinal cancer.
Narmchesh m, S., *et.al.,* 2022	Case-control	178 pacients	It identified three nutrient patterns: the first pattern included pantothenic acid, riboflavin, zinc, animal protein, and calcium. Selenium, thiamine, carbohydrate, vegetable protein, niacin, and low vitamin E intake carried the second pattern, and the third pattern was abundant in fiber, carotene, vitamin C, and A.	No significant association was found between gastric cancer and any of the dietary patterns. However, a dietary pattern rich in animal products may increase the risk of GC among Iranian men.
Rafieea, P., *et.al.,* 2020	Case-control	130 pacients	Patients with colorectal cancer had a higher consumption of salt, fried, grilled, and cooked foods. Turmeric intake was also reported among all participants.	The results provide evidence of an inverse association between dietary total antioxidant capacity (TAC) and CRC risk in a developing country with its specific dietary habits.
Sun, L., *et.al.,* 2017	Prospective cohort	1.297 pacients	Moderate intake of foods that are sources of flavonoids.	No positive association was found with a lower risk of developing esophageal and gastric cancer in relation to flavonoid intake.
Tasneenm, A.A., *et.al*., 2020	Transversal	163 patients (82 male and 81 female)	Consumption of unpackaged cooking oil, unpackaged seasonings, unpasteurized milk, and unfiltered water.	Environmental and dietary agents may promote the development of gastrointestinal cancer.
Zhang, Y., *et.al.,* 2021	Cohort study	2,081 patients (female)	Eating unhealthy foods at any time of the day. There were no specific times for meals, and the quality of the food was not considered important.	Consuming unhealthy foods at any time of the day has been shown to increase the risk of digestive system cancer.

Source: Elaborated by the authors.

DISCUSSION

The incidence of digestive tract neoplasms, encompassing both the upper and lower gastrointestinal tract, has experienced a substantial rise over the past decade, particularly among young individuals between the ages of 20 and 49. Data research reveals that environmental factors, such as unhealthy dietary habits, the inclusion of cancer-causing substances in the food, cooking techniques like frying and smoking, and a deficiency of antioxidants, play a substantial role in the onset of gastrointestinal cancer. These habits, along with a lack of physical activity, change the composition of the microorganisms in the digestive system and make someone more likely to develop cancer (Tasneem & Luck, 2021).

According to Mejborn et al. (2020), research indicates a correlation between a high intake of red and processed meat and a higher occurrence of colorectal cancer. The gut microbiota has the ability to convert preservatives such as nitrates and nitrites found in processed meats into cancer-causing substances, which in turn raises the likelihood of developing colorectal cancer (He et al, 2019). In addition, Bradbury et al. (2019) discovered that individuals who consumed 76 g/day of red and processed meat had a 20% increased likelihood of having colorectal cancer compared to those who consumed only 21 g/day. These findings align with previous research that has established a connection between the eating of red and processed meat and a higher likelihood of developing gastrointestinal cancer (S Deoula et al, 2020).

The presence of inflammation promotes the movement of monocytes to tissues, where they undergo differentiation into macrophages, hence aiding in the advancement of cancer (Julián-Serrano et al, 2022; Djuric et al, 2012). Consuming diets that are high in lipids, particularly saturated fatty acids, is linked to pancreatic cancer; this affects the expression of inflammatory markers like IL-6 and NF-κB, which provide a favorable environment for the development of cancer (Julián-Serrano et al, 2022). Research indicates that long-term inflammation, caused by diets high in fat, might lead to the interaction of cytokines and leptin, producing a favorable environment for the development of cancer (Djuric et al, 2012). Conversely, diets that are low in fat and

high in unsaturated fatty acids, such as omega-3 and omega-6, have been linked to a reduced risk of cancer because of their anti-inflammatory properties (Julián-Serrano et al, 2022). Research shows that eicosanoids, which are produced from eicosapentaenoic acid found in cold-water fish and vegetables, possess anti-inflammatory properties that can lower the risk of cancer development. This suggests that these unsaturated fatty acids regulate the production of inflammatory cytokines, thereby contributing to the protection against cancer (Calder, 2013).

A Mediterranean diet, which includes whole foods, vegetables, and marine proteins, has been found to be a preventive measure against cancer, particularly stomach cancer. This is achieved by positively influencing the expression of anti-inflammatory cytokines (Gunathilake et al, 2021; Cheng et al, 2018). This diet also involves consistent intake of olive oil, which is abundant in polyphenols and possesses antioxidant and anti-inflammatory characteristics (Covas, 2007). Research indicates that following the Mediterranean diet is linked to a reduced occurrence of several forms of cancer, such as colorectal and pancreatic cancer (Schwingshackl and Hoffmann, 2016).

The findings indicate that consuming nutritious diets, which include a sufficient amount of fruits, can serve as a safeguard against stomach câncer; this preventive effect is attributed to the antioxidant properties of these diets and their ability to regulate nitric oxide and reactive oxygen species (Rafiee et al, 2021). Consistently eating fruits and vegetables is linked to a lower chance of developing stomach cancer, as these foods contain bioactive substances that regulate inflammatory and oxidative processes. In addition, fruits and vegetables are abundant in dietary fiber, which is essential for promoting gut health and reducing the risk of gastrointestinal cancer (WCR, 2018).

However, the consumption of processed products and disordered eating behaviors are associated with an increased risk of gastrointestinal cancer due to oxidative stress and the activation of inflammatory pathways (Zhang et al, 2021; Gunathilake et al, 2021). Industrialized products often contain additives and preservatives, such as nitrites and nitrates, which are metabolized into carcinogenic compounds in the digestive tract due to increased oxidative stress and promote chronic inflammation, which are critical factors in the development of cancer (Buller et al, 2021).

Processed foods, which contain high levels of nitrites and nitrates, have the potential to cause cancer, particularly stomach cancer (Buller et al, 2021). The International Agency for Research on Cancer has classified these compounds as probable human carcinogens because they can be converted into nitrosamines, which are highly carcinogenic substances (IARC, 2015). Consuming red and processed meat, which contains substances like polycyclic aromatic hydrocarbons and heme iron, also heightens the likelihood of developing cancer (S Deoula et al, 2020). Research indicates that these substances can induce DNA harm and facilitate the development of cancer-causing chemicals in the gastrointestinal tract (Sinha et al, 2009).

Adopting changes in dietary patterns and engaging in regular physical exercise are crucial for the prevention of chronic illnesses, such as gastrointestinal cancer. Research indicates that diets with a high inflammatory potential are associated with an increased occurrence of colorectal adenomas, which are precursors to colorectal cancer (Bodén et al, 2019). Chronic inflammation plays a significant role in cancer development and progression by inducing DNA damage and promoting continuous cell growth; therefore, lowering the consumption of inflammatory meals and increasing the intake of anti-inflammatory foods can aid in preventing cancer formation (Grivennikov et al, 2010).

Studies suggest that consuming dietary fiber, particularly from whole grains, is linked to a decreased likelihood of developing colorectal cancer (Bradbury et al, 2020; Hullings et al, 2020). Dietary fiber enhances intestinal health by augmenting the amount of fecal matter and decreasing the time it takes for food to pass through the intestines, which can minimize the contact between the intestinal lining and substances that can cause cancer (Slavin, 2000). In addition, the gut microbiota ferments fibers, resulting in the production of short-chain fatty acids, including butyrate, which has anti-inflammatory and chemoprotective properties (Louis et al, 2014).

Different types of fiber can have different impacts on intestinal health and the risk of colorectal cancer, while the fermentation of dietary fiber by the intestinal microbiota reduces fecal pH and the production of bacterial carcinogens, providing a chemoprotective effect (Kværner et al, 2021). Despite the attention focused on the different effects of soluble and insoluble fibers on the composition of the microbiota and the production of intermediate compounds of bacterial metabolism (Anderson et al,

2009), some studies have not found significant associations between the intake of fiber from fruits and vegetables and the reduction in the risk of colorectal cancer (Park et al, 2005). Although there is evidence and research suggesting that consuming fiber helps protect against cancer, further investigation is necessary to fully understand the results, as they currently lack convincing findings. Thus, further investigation is required to elucidate the correlation between various sources of dietary fiber and the risk of gastrointestinal cancer.

CONCLUSION

The systematic review emphasizes that there is substantial evidence linking dietary patterns and lifestyle choices to the occurrence of cancer, particularly in relation to the gastrointestinal system. Risk factors for health include diets that are high in red and processed meat, have high calorie consumption, and lead to obesity. On the other hand, diets that are rich in fiber, whole grains, vitamins, and antioxidants, particularly the Mediterranean diet, have a protective impact. Emphasizing the adoption of nutritious eating patterns is essential for the prevention strategy of gastrointestinal cancer.

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