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Review Paper

Cancer And Food Consumption

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ABSTRACT

Cancer continues to be the leading cause of death worldwide. Even though basic research and clinical practice have advanced significantly, treatments like surgery and chemoradiotherapy still have adverse effects. Additionally, throughout the years, the amount of study on food and cancer has increased dramatically. This minireview's goal is to provide an overview of the connections between different foods and malignancies. Methods: The search method looks for English-language Pubmed papers from 2014 to 2024 that contain the keywords "cancer AND food consumption AND diet" in the Title/Abstract section. Results: The most recent research on the connection between different foods and cancers, including cancer incidence, death, and therapy, was compiled in this minireview. Fermented foods, ultra-processed foods, organic foods, food nutrition, bioactive peptides, and dietary patterns are among the foods. These cancers include head and neck cancer, hepatocellular cancer, pancreatic cancer, ovarian cancer, lung cancer, breast cancer, gastrointestinal cancer, esophageal cancer, urinary system cancer, and obesity-related cancer. In conclusion, food has the power to either cause or prevent cancer, as well as to accelerate or slow its course. The development of dietary interventions for cancer prevention should be aided by this minireview.

INTRODUCTION

According to estimates, the number of cancer cases will rise to up to 20 million annually by 2030, making it the second leading cause of death worldwide. Treatment options for cancer include radiation, chemotherapy, and surgery, all of which have the potential to lower a patient's quality of life [1]. Unquestionably, scientific research and clinical practice have advanced, yet the number of cancer patients globally is still rising. Lung and urinary system cancers, as well as breast cancer, are more common [2]. Early tumor discovery also results in longer treatment times and much greater healthcare expenses. Therefore, the most economical long-term approach is to regulate the prevention of chronic diseases globally. One of the key strategies to lower the risk of cancer is to

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follow a particular diet that has no negative side effects. Plant meals high in naturally occurring anti-angiogenic compounds may often have a prophylactic or protective effect on the arteries. The target population determines the level at which angiogenesis inhibition is used, however it may help reduce the growth of tumors at various stages [3]. Breast cancer, cancer of the urinary system, lung cancer, ovarian cancer, gastrointestinal cancer, esophageal cancer, head and neck cancer, hepatocellular carcinoma, pancreatic cancer, obesity-related cancer, and other malignancies have a close link with diet. Foods can be classified according to their types, feeding or sensory purposes, ultra-processed foods (UPF), food nutrition, bioactive peptides, and food security. Food has the power to either cause or prevent cancer, as well as to accelerate or slow its course. Food and cancer research has been expanding rapidly for decades [4]. Chinese people have a wealth of experience with food management because of their legacy of using edible and medicinal homologous foods. According to "Huangdi Neijing Tai Su," "patients eat for medicine, fasting food for food." Many foods are both food and medications. The grain serves as sustenance. Health protection benefits from the use of Chinese medicine and food-homologous nursing expertise. In addition to analyzing the association between food and cancer incidence, death, and treatment, this minireview aims to demonstrate the relationship between different foods and cancers. The development of dietary strategies for public health will benefit from this minireview

Food Patterns or Types and Cancer

1. Food pattern

Breast cancer and colorectal cancer are used as examples in this section. Approximately 10% of all malignancies are colorectal cancers. Food has a significant impact on the development of colorectal cancer for anatomical reasons. The increased meat component of Western diets is intimately linked to the higher incidence of colorectal cancer in affluent nations [5]. It is acknowledged that a plant-based and economical eating pattern is a healthy one. Unhealthy eating habits are those that involve consuming meat and other animal products. While high adherence to healthy food habits is linked to a 38% decreased risk of breast cancer, adherence to bad eating patterns may raise the risk of breast cancer [6]. According to several studies, people who have survived breast cancer typically eat less plant-based meals such fruits, vegetables, and legumes, which results in worse eating habits. Enhancing dietary nutrition may have major positive effects on patients' general health because breast cancer survivors frequently gain weight while undergoing treatment, which raises their risk of recurrence and death. Whole grains, legumes, olive oil, and fruits and vegetables are the mainstays of the Mediterranean diet. It works well and is simple to follow. It has a number of positive health impacts, including reducing obesity. Foods with anti-inflammatory and antioxidant qualities, as well as bioactive substances, are among the many nutrients that make up this dietary pattern. The pathophysiology of colon cancer is strongly linked to poor dietary practices, which are also becoming more and more linked to worsened outcomes, such as the chance of cancer mortality and recurrence. The process of using a computer in a clinic or at home to evaluate the eating habits of colorectal cancer patients under cancer surveillance is known as dietary evaluation. The 2015 Healthy Eating Index score was used to quantify dietary quality, while ANOVA and Pearson correlation were used to assess statistical significance. While there were no variations in diet quality by sex, education, or tumor site (rectum and colon), there was a significant negative correlation between lower diet

quality and longer time after diagnosis. Diet quality scores were higher among patients who were toward the end of their cancer treatment, older, non-obese, and single. Through tailored therapies aimed at particular dietary patterns, research incorporating computer evaluation into cancer care would enhance diet quality [9

2. Food Types

1) Fermented food

Pickles, coffee, wine, sauerkraut, miso, tempeh, yogurt, kimchi, cheese, kefir, kombucha, oil, and sourdough bread are examples of prevalent fermented foods. Fermented foods are a viable food intervention that improves immunity by changing the gut microbiota's composition and is crucial for increasing cancer survival rates overall. High-fiber diets may not alter the gut flora as quickly as fermented foods. The microorganisms found in fermented meals might comprise either probiotics or non-probiotics. Fermented foods may have a significant impact on health outcomes through immunological modulation, as the gastrointestinal tract contains around 70% of the body's immune system. In addition to improving food tolerance and the bioavailability of vitamins and minerals, fermentation also improves the nutritional value and functional qualities of meals and supports human health [10]. The ability of the microbes in fermented foods to survive digestion, make it to the gut, and be bioavailable is one of the important problems that remain unanswered despite the enhanced benefits of consuming fermented foods for the development and progression of cancer. There is insufficient information to demonstrate how alterations in the gut microbiota affect the association between fermented foods and health outcomes because existing research designs in human epidemic populations are diverse and extremely varied. Probiotic supplements may be helpful, and including fermented foods in regular meals is advised. Probiotics are generally not advised for everyday use, though, and fermented foods might be a safer option than prescription drugs. One type of microbial metabolism in the gut microbiome is fermentation. Fermented foods produce a wide range of bioactive metabolites that can affect metabolic, immunological, and disease severity. Research on fermented foods as a potential food intervention for cancer survivors has not yet been done, despite the fact that they are one of the gut microbiome-targeted diets that may offer long-term treatment for cancer patients and survivors. Future studies may combine the microbiome with proteomics, metabolomics, and genomics techniques to employ fermented foods as a probiotic substitute that enhances health, the prognosis of cancer, and the response to cancer treatment. Approximately 85% of the bacteria that populate the human gut and the structure of the mouse gastrointestinal tract differ significantly from those of humans, thus future studies may still concentrate on humans. Controlling the individual microbiota to improve the effects of immunotherapy is one of the future objectives [10]

2) Ultra-processed foods

Alternative diets can lower the incidence of several malignancies, according to research on nutrition and cancer from a prospective European cohort. With numerous cancer endpoints and diagnostics, this is the biggest multicenter prospective cohort study ever carried out, and the findings are solid. Participants in the EPIC cohort were gathered between 1991 and 2001 from 23 universities, university hospitals, and cancer research facilities spread across ten European nations. In order to observe the effect on cancer risk at 25 anatomical sites, 10% of processed foods and UPF were replaced with 10% of minimally processed foods using the Cox proportional risk

model for substitution analysis [11].According to the research, a diet high in fresh and minimally processed foods, such as whole grains and non-starchy vegetables, may lower the risk of developing a number of cancers, whereas a diet high In processed foods and UPF raises the risk. There was a 4% overall decrease in cancer risk when 10% of processed foods were swapped out for minimally processed foods. The risk of many specific cancer forms, such as hepatocellular carcinoma (23%) and esophageal adenoma (43%), was significantly reduced.The incidence of hepatocellular carcinoma decreased by 27%, esophageal squamous cell carcinoma by 20%, and total cancer by 1% when 10% UPF was substituted with minimally processed foods. Because obesity is a known risk factor for over 13 site cancers, researchers hypothesize that a diet high in UPF is linked to obesity, which is frequently characterized by low food quality and high energy density. As a result, UPF may raise the risk of cancer due to its low nutritional value and obesogenic qualities [11]. UPF guidelines in Europe may be comparable to those in the US, which include consuming a range of fresh fruits, vegetables, and whole grains while avoiding processed meats, sugar-filled beverages, and red meat. The inability to obtain comprehensive information on every food item might lead to food misclassification, which is a significant problem of the majority of ultra-processed food intake survey studies. Additionally, chemicals and pollutants from food manufacturing can be involved. Future dietary guidelines may consider the possible health impacts of food composition and composition. A wide range of highly processed foods may contain several non-nutritional additives, including flavorings, emulsifiers, preservatives, and other chemicals. To further assess how food processing affects canning-related biomarkers and health, carefully planned clinical trials are required [11]. 101,729 adult Americans were identified as part of a population-based cohort by Guo-Chao Zhong et al. A validated meal frequency questionnaire was used to measure fried food consumption. According to the findings, there were 402 cases of pancreatic cancer and an average follow-up of 8.86 years. They discovered that among Americans, eating fried food was negatively correlated with the chance of developing pancreatic cancer. Potato chips seem to play a major role in the reduction of pancreatic cancer risk associated with fried meals [12].

3) Food types and multiple cancers

Plant-based foods, like fruits and vegetables, have been demonstrated to lower the risk of or improve survival for a number of malignancies, such as breast, digestive, obesity-related, and urinary tract cancers. Specifically, by controlling long non-coding RNA, dandelion, which is rich in nutritious foods, prevents a number of tumors, such as hepatocellular carcinoma and its associated cancers, female cancers like breast or cervical cancer, and the growth and spread of gastric cancer. The dandelion is a widespread plant with a comparatively broad global growing distribution. Since it has no negative effects, dandelion has been used extensively as a dietary and folk remedy to heal liver and kidney problems as well as cancer, particularly in women. IN a number of studies, Asma Kazemi et al. looked at the connection between dietary groups and breast cancer. The items they looked at were grains and cereals, nuts, legumes, soy, processed meats, red meat, fish, chicken, eggs, vegetables, fruits, dairy products, and beverages with added sugar. There was no clear correlation between the risk of breast cancer and any other food group. Consuming more than 450 grams of milk per day raised the risk of breast cancer, but lower intakes showed no correlation. A decreased risk of breast cancer is linked to a higher consumption of fruits,

vegetables, dairy, and soy products and a lower consumption of red and processed meats [13].Eating fruits and vegetables lowers the risk of breast cancer. Consuming isoflavones and soy protein decreased the risk of breast cancer by 12 and 35 percent, respectively. Drinking alcohol raises the risk of breast cancer by 75%. Consumption of green tea, pork, and soy products did not significantly alter the risk of breast cancer [6]. Yuko Minami et al. looked at the connection between gastrointestinal cancer patients' chance of dying and their consumption of six Japanese food pretreatments. Regular consumption of seaweed was negatively correlated with all-cause mortality in patients with colon cancer, while regular consumption of soy products was negatively correlated with all-cause risk in patients with stomach cancer. According to these findings, Japanese foods like soy products and seaweed may improve patients' chances of surviving colorectal and stomach cancer, and food factors may influence the prognosis of digestive tract cancer [14]. The incidence of colon cancer can be decreased by converting to a plant-based diet from an animal-based one. According to research by Rilla Tammi et al., core-specific hazard ratios for colorectal cancer can be calculated using Cox proportional risk models by substituting fruits, vegetables, or a combination of fruits, whole grains, and vegetables for red meat (100 g/week) or processed meat (50 g/week). During the 28.8 years of follow-up, 1,124 colorectal malignancies were diagnosed, indicating a modest (1%), decreased risk of colorectal cancer. To sum up, even small-scale, simple plant-based diets can lower the risk of colorectal cancer in individuals who consume a lot of meat [15]. In the United States, obesity-related cancers account for 40% of all cancers, and the International Agency for Research on Cancer discovered a connection between obesity and 13 different cancer types. It has been demonstrated that eating a nutritious diet can lower the death rate from cancer linked to obesity. The findings, which were based on both high and low death rates, showed that the percentage of people over 65 and greater rates of poverty were higher in 3,038 counties with higher death rates from obesity-related cancers. The likelihood of a high rate of obesity-related cancer death rose by 77% in U.S. counties or comparable counties that were populated by food swamps with fast food establishments and low-nutrient meals. The findings of this cross-sectional ecological study together recommend that funding organizations, community stakeholders, and legislators embrace sustainable strategies to prevent cancer and obesity and to access better food options [16]. Urinary malignancies can be avoided by eating certain meals derived from plants. In their review, Melissa Garcia-Caballero et al. presented epidemiological evidence that emphasized the relevance of plant-derived meals in bioactive phytochemicals for the prevention of vascular cancer [3].

Food and Cancer Incidence/Mortality

Breast cancer, one of the most prevalent tumors globally, is the most common malignancy that results in cancer-related deaths among women. Environmental variables have a substantial influence on breast cancer. Foods and certain nutrients have been shown to have a major role in the development of breast cancer, and by altering the epigenetic environment, dietary components can either prevent or encourage the growth of breast cancer. Food can alter the methylation levels of tumor suppressor genes and oncogenes, but it can also alter non-coding RNA pathways, histone chemical changes, and microbiome metabolism, according to overall omics studies on food and breast health. Breast cancer prevention and treatment are the study's possible application prospects [17]. A lower incidence of stomach

cancer was associated with overall organic food consumption compared to patients who did not eat organic food. And there was an association between whether or not to eat organic food as opposed to organic food intake and overall cancer incidence. Julie Louise Munk Andersen et al estimated the relationship between cancer incidence and organic food consumption. They used data from the Danish Diet, Cancer and Health cohort on organic food categories including fruits, dairy, vegetables, meat, eggs, bread and cereal products. There were 9,675 first cases of cancer among the 41,928 participants followed over 15 years. There is little research on the relationship between eating organic food and the incidence of cancer in general, and the findings on certain cancer risks have been inconsistent [18]. In patients with gastrointestinal or lung malignancies, energy and protein intakes determined by food diaries are frequently linked to weight loss and appetite reduction (intake ≤ 70% of recommended values). The Functional Assessment of Anorexia/Cachexia Therapy and a particular anorexia questionnaire are used to evaluate patients' appetite loss. Since the pathophysiology of cachexia may be significantly influenced by negative protein and negative energy balance, early multimodal efforts to increase food intake are desperately needed [19]. Chronic inflammation, which may be impacted by dietary practices, is a significant contributor to primary liver cancer. Additionally, a greater incidence and mortality rate of primary liver cancer are linked to a more inflammatory diet. The incidence and mortality of primary liver cancer can be decreased by increasing consumption of foods with anti-inflammatory qualities and decreasing consumption of those with pro-inflammatory qualities [20]. The association between consumption of contemporary UPF and carcinogenesis and various types of cancer is the main topic of the content that follows.

1. Intake of Ultra-Processed Foods and Carcinogenesis

In many nations, UPF has become a staple diet and is growing in dominance worldwide. In such instances, UPF makes up 60% of daily energy intake and is linked to a higher risk of cancer. According to epidemiological data, the global obesity pandemic and the burden of chronic diseases may be partially caused by a change in food processing practices around the world. According to available data, UPF may raise the risk of cancer by exposing users to substances that may cause cancer and having obesogenic qualities. Improving knowledge of the possible hazards of UPF to cancer risk and the environment is one of the key topics for policy implications and future research, given there aren't enough prospective studies examining the association between UPF intake and cancer outcomes [21]. A review of the relationship between UPF consumption and cancer risk was conducted by Irja Minde Isaksen. Ultra-processed food consumption was found to have a clear positive correlation with all cancers examined, with the exception of prostate cancer. The risk of breast cancer and all types of cancer increased when the amount of UPF in the diet rose by 10%. An elevated risk of colorectal and pancreatic cancer is linked to high UPF intake [22]. A review of the relationship between UPF consumption and cancer risk was conducted by Irja Mind Isaksen. Ultra-processed food consumption was found to have a clear positive correlation with all cancers examined, with the exception of prostate cancer. The risk of breast cancer and all types of cancer increased when the amount of UPF in the diet rose by 10%. An elevated risk of colorectal and pancreatic cancer is linked to high UPF intake [22]. It may be possible to lower the risk of some types of cancer by substituting equivalent portions of less processed foods for processed and UPF foods. The impact of

substituting 10% of processed and UPF foods with 10% of microprocessor foods on cancer risk at 25 anatomical locations was evaluated by Nathalie Kliemann et al. using Cox proportional risk models. A lower risk of all cancers (head and neck cancer, esophageal squamous cell carcinoma, rectal cancer, colon cancer, hepatocellular cancer, and postmenopausal breast cancer) was linked to substituting 10% of processed meals with an equivalent quantity of the least processed foods. A lower risk of colon, hepatocellular, and head and neck cancer is linked to substituting 10% of processed foods with 10% of microprocessor foods [23]. In men, the highest UPF intake was linked to a higher risk of breast, colon, and colorectal cancer, but not prostate or colorectal cancer. In conclusion, a clear elevated risk of several site-specific malignancies, especially those connected to hormones and the digestive tract, was linked to excessive UPF intake. To improve our understanding of causal pathways, prospective experimental experiments are being carefully planned [24]. The relationship between higher UPF and cancer outcomes is not well supported by prospective data. According to Kiara Chang et al.'s large UK cohort study, there is a positive correlation between UPF use and the risk of morbidity and death from both general and some site-specific malignancies. Using a UK Biobank dataset, this study aimed to investigate the association between UPF intake and the risk of cancer mortality and overall/site-specific cancer incidence. There are drawbacks, such as incomplete information about some foods, even though this study used a conservative method to group foods into lower processing groups. To better identify the intervention target, more investigation into the mechanistic pathway is required [25]. Overall, there was a clear correlation between UPF intake and the chances of both many cancers and cancer in general. Policymakers, the public, and the updated dietary guidelines can all benefit from this data in order to promote public health.

2. Intake of Ultra-Processed Foods and Mortality

Higher UPF intake in individuals with a history of cancer was linked to an increased risk of death in the prospective cohort study of 13,640 UK Biobank participants with a history of cancer. The weight ratio of UPF to total food consumption was used to calculate UPF consumption, and Cox proportional risk models were used to evaluate the relationship between UPF intake and participant death. Over a median follow-up period of over 10 years, 1611 deaths were documented [26]

3. Ultra-Processed Foods and Many Cancers

In the majority of middle- and high-income countries, UPF has become a significant part of the diet. Additionally, using UPF is significantly linked to an increased risk of developing several types of cancer, such as colorectal, breast, and pancreatic cancers [27].The evidence to date indicates that UPF may raise cancer risk through obesogenesis, alcohol use, food quality variables, and non-nutritious food processing components, while the precise mechanism of the association between UPF consumption and several malignancies is unknown. UPF consumption, for instance, may raise the risk of kidney cancer through obesity; further population-based experimental research is required to validate these correlations and clarify the potential pathways [27].Prior to a cancer diagnosis, high UPF use dramatically raised lung mortality linked to all-cause risk. However, cancer does lower UPF intake prior to diagnosis, which could increase lung cancer patients' overall survival rate [28]. Consuming UPF, however, is also unrelated to the risk of ovarian cancer and certain types of cancer [29]. In conclusion, when creating dietary

guidelines, public health and food policy should take food processing concerns into account.

A) Breast Cancer

Numerous epidemiological studies have looked into the connection between the risk of UPF intake and breast cancer, with varying degrees of success. According to certain research, there is no connection between UPF and breast cancer. There was no association between the all-cause and cancer-specific deaths of 2443 patients with breast cancer who consumed UPF, according to Jian-Yuan Pu et al. [28]. There was no correlation between UPF use and breast cancer, according to an evaluation using unconditional multivariate logistic regression [30].A systematic review and meta-analysis were carried out to investigate whether there was a correlation between high UPF intake and breast cancer risk after Long Shu et al. discovered that UPF was strongly linked to breast cancer. The highest intake of UPF was linked to a greater risk of breast cancer than the lowest consumption. According to linear dose response study, the incidence of breast cancer increased by 5% with every 10% increase in UPF consumption. A substantial positive correlation was found between intake and breast cancer risk for case-control study subgroups and subgroups with sample sizes under 5000. To validate these findings, however, more investigation is required, particularly in the form of large prospective cohort studies [31]. A mechanism via which UPF consumption is positively linked with breast cancer risk is shown by a large-scale cohort of the European Prospective Investigation into Cancer and Nutrition (18,814 breast cancer cases/500,000 people). Inge Huybrechts et al.'s study, which included young women in Los Angeles, Latin American populations (20% of whom were women under 45), and Western populations, found a positive association between UPF use and breast cancer. Therefore, global intervention to limit intake is urgently needed to alleviate the cancer burden, considering the pervasive nature of UPF consumption [32].

B) Prostate cancer

Consuming UPF did not raise the risk of prostate cancer. As of right now, five epidemiological studies involving 764,261 participants have particularly examined the relationship between UPF intake and cancer risk for the urinary system, including kidney, bladder, and prostate cancers. Additionally, using UPF is not linked to a higher risk of prostate cancer. There was no correlation between the incidence of prostate cancer and every 10% increase in UPF intake [26]. In order to demonstrate that there is no association between UPF and the incidence of prostate cancer, Dora Romaguera et al. employed unconditional multivariate logistic regression [30].Jian-Yuan Pu et colleagues. Discovered, however, that patients with prostate cancer who took a lot of UPF prior to being diagnosed were at higher risk in a non-linear dose-response fashion. Additionally, lowering UPF consumption prior to a cancer diagnosis may increase some prostate cancer patients' chances of survival. Patients with BMI ≥25 did not have prostate cancer-specific mortality, whereas those with BMI <25 had prostate cancer [28].

C) Colorectal cancer

The incidence of colorectal cancer precursors increases with increased consumption of highly processed foods, and UPF may be a modifiable factor in the prevention of colorectal cancer in its early stages [33]. According to research by Jian-Yuan Pu et al., in certain colorectal cancer subgroups, lowering UPF intake prior to cancer diagnosis may enhance cancer-specific survival. In patients with stage I and II colorectal cancer, but not stage III and IV, UPF intake was significantly

positively correlated with colorectal cancer-specific mortality, according to subgroup analysis [28].Dora Romaguera et al. used a case-control study based on population and unconditional multivariate logistic regression to evaluate the association between UPF and colorectal cancer. And the results showed that there was a correlation between colorectal cancer and UPF consumption [30].

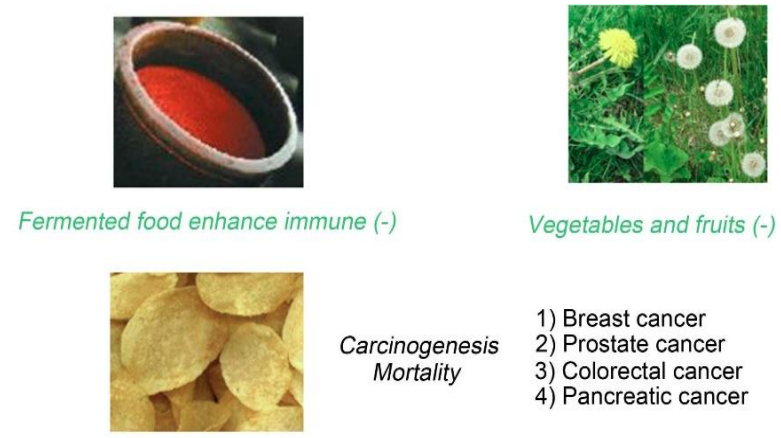
D) Pancreatic cancer

It is unknown if using UPF increases your risk of developing pancreatic cancer. A prospective study was carried out by Guo-Chao Zhong et al. to ascertain whether UPF use is linked to an increased risk of pancreatic cancer. Prostate, lung, colorectal, and ovarian cancer screening trials were used to identify a cohort of 98,265 adult Americans.An average of 8.86 years of follow-up was used to identify 387 instances of pancreatic cancer. Excessive use of UPF has been linked to an increased risk of pancreatic cancer. According to these results, cutting back on UPF use might help lower the incidence of pancreatic cancer [12].

Food treatment and cancer.

1. Food Nutrients and Compound Components

1) food nutrition



Cancers are (−) inhibited and (+) promoted.

Figure 1. Food patterns and cancer carcinogenesis/mortality.

Alicia K. Heath et al.'s European Prospective Investigation into Cancer and Nutrition, however, found that retinol and beer/cider consumption were positively connected with the risk of lung cancer without gender differences, but did not demonstrate that consumption of 92 particular foods and nutrients significantly affected the risk of primary lung cancer [33].Numerous natural items have been found to be effective in combating different types of cancer with fewer adverse effects, and it may be possible to enhance cancer patients' diets. For instance, fatty acids are biomarkers of the development and spread of cancer, making fatty acid-based customized therapy possible. The application of fatty acid and nutrient-based diets to aid in the treatment of cancer is a multidisciplinary topic in clinical and molecular research. The patient's nutritional state had a significant impact on the outcome of a tumor treatment, even after accounting for other crucial elements like formulation and bioavailability. The majority of cancer patients now take vitamins and minerals to enhance normal care and/or lessen negative side effects and the risk of developing the

disease. The treatment of cancer requires a holistic strategy that appropriately integrates pharmacological strategies and nutrition, whereby the right kinds of supplemental micronutrients, such as those used in oncology, should be taken at the right times [34] [35].

2. Food components of compounds

Numerous bioactive food components can be found in fruits and vegetables, and between 2000 and 2020, the body of research on these ingredients will continue to expand. Additionally, foods that include these components are protective and good for your health. Curcumin, resveratrol, quercetin, sulforaphane, and capsaicin are examples of bioactive food compounds that have been demonstrated to treat a variety of cancer types, including breast, lung, colorectal, leukemia, and liver cancer. As adjuvants, bioactive dietary components can improve the effectiveness of traditional colorectal cancer treatment [5].Many dietary sources include isopentenated flavonoids as a single phytochemical. This chemical, which has been found in over 1000 varieties thus far, is harmless and possesses anti-cancer properties [36]. A synergistic effect between food components was suggested by the fact that different meals had greater efficiency as whole extracts than their corresponding phytochemicals. Drug resistance can be overcome by combining bioactive medications with already available chemotherapeutic medications to maximize their anti-cancer effects [4].It has also been investigated how bioactive food elements work at the molecular level to prevent cancer. The molecular underpinnings of the anticancer benefits of bioactive dietary elements (mostly derived from plants or microbiomes) in a number of cancer models were reviewed by Manas Yogendra Agrawal et al. Apoptosis and the major oncogenic signaling axis, including Akt/PI3K, JAK/STAT, and NF-κB, are the principal mechanisms of cell death for the majority of dietary bioactive chemicals [4].Uncontrollably dividing cancer is formed by serial mutations in healthy cells, which can happen as a result of DNA damage brought on by high ROS levels in healthy cells. Oxidative stress caused by high ROS levels promotes the growth of cancer cells, while anticancer treatment can benefit from the cytotoxic consequences of high ROS levels. Natural foods including fruits, vegetables, herbs, and honey contain biologically active compounds that control the body's levels of reactive oxygen species to avoid oxidative stress. Additionally, these bioactive substances show promise as natural antioxidant sources [1].

2. The Bioactive Peptides From Food

Certain peptides, typically comprising 2–20 amino acid residues, are known as bioactive peptides. These peptides actively exert a variety of biological actions and functions that ultimately impact health. Treatments for cancer and inflammatory illnesses may use tactics that focus on programmed cell death. In order to present and introduce the significance of bioactive peptides from food proteins in controlling programmed cell death (including autophagy, apoptosis, pyroptosis, iron death, and necrotic apoptosis) on inflammatory disorders or tumors, Zhao Deng et al. analyzed the literature from 2015. The majority of research on bioactive peptides and programmed cell death has been on iron death, pyroptosis, and apoptosis.The overproduction of inflammatory cytokines can be suppressed by autophagy and apoptosis. Iron death, pyroptosis, and necrotic apoptosis can harm tissues and accelerate the course of inflammation. In conclusion, bioactive peptides regulate programmed cell death, which contributes to the maintenance of bodily health in addition to oxidative stress and inflammation [37].

3. Mediterranean Diet and Cancer

In order to better understand patients' experiences with nutritional interventions to optimize dietary patterns during chemotherapy, Brianna I. Harvey et al. undertook a randomized research to examine the effects of an 8-week Mediterranean diet intervention on cancer-related fatigue [38]. In their evaluation of the impact of a Mediterranean diet high in polyphenols on children with cancer, Ashly Liu et al. discovered no meaningful relationship between the intensity, type, and other markers of cancer treatment and the total amount of polyphenols consumed daily. In order to assess the effectiveness of dietary patterns high in polyphenols for nutrition intervention in children with cancer, more extensive research required in the future [39].

Food and Various Cancers

1. Breast Cancer

1) The onset risk of breast cancer

In a hospital-based case-control research at a tertiary care facility in India, Vijith Shetty et al. came to the conclusion that "a high-fat, low-fiber diet is the most important risk factor for breast cancer [40]." The results on the association between dairy product consumption and breast cancer risk are inconsistent, according to the studies that are currently available. Using 18 publications—9 prospective studies, 7 retrospective studies, and 2 cross-sectional studies—Heba Mohammed Arafat et al. assessed the connection between dairy consumption and the occurrence of breast cancer.

Future research should take into account the use of dairy products in a balanced diet, as the results showed a negative correlation between dairy consumption and the risk of breast cancer [41]. An ecological analysis of 95% of Colombian women residing in 24 geographical population units was carried out by Oscar F. Herran et al. Breastfeeding duration and breast cancer rate are inversely correlated ($\beta = -3354.1$) [42]. The findings indicated that longer breastfeeding duration, adherence to traditional food consumption patterns, and provision of health information, irrespective of food type, could all help prevent breast cancer [42].

Luan Miranda de Godoy et al. investigated the connection between the incidence of breast cancer and the quality of dietary components. Breast cancer was not linked to dietary quality as measured by the Brazilian Healthy Diet Component Assessment or its index. [43]

2) The treatment of breast cancer

Mariana T. M. Lima et al. studied 84 Tamoxifen users in a Brazilian university hospital from March 2015 to March 2016. According to the findings, the quality of the diet improved with increased eating frequency and earlier mealtimes [44]. The association between food intake and breast cancer risk in black South African women was examined by Inarie Jacobs et al. The findings indicated that South African black women consume a diet rich in fruits and vegetables while consuming fewer foods that are low in caloric density and micronutrients, such salty meals. Health intervention plans should use these suggested methods, which should be reasonably priced [45].Isis Danyelle Dias Custodio et al. conducted a dietary assessment of 55 breast cancer patients during treatment and discovered that increasing pro-inflammatory behavior was linked to increased abdominal fat. This suggests that patients with breast cancer who are receiving treatment for the side effects of chemotherapy should continue to eat healthily [46]. A higher average adequacy ratio index was linked to a lower incidence of breast cancer, according to studies by Mohammad Hassan Sohouli et al. Potential recommendations for the

prevention of breast cancer in Iranian women were based on the dietary patterns indicated by these scores [47].

2. Cancers of the Digestive System

1) Carcinoma of the esophagus

In order to evaluate the relationship between the primary food diets and the risk of esophageal cancer in both high- and low-risk regions of northern Iran, Faezeh Salamat et al. employed multivariate logistic regression. Further research is required to assess the significance of dietary determinants in this high-risk group, as it was determined that dietary intake may be a significant contributor to the prevalence of esophageal cancer in northern Iran [48]. Data from a multicenter case-control study of esophageal squamous cell carcinoma carried out in Italy and Switzerland between 1992 and 2009 were examined by Michela Dalmartello et al.

Three dietary patterns were found by the study's findings: a "low-consumption mix pattern," a "Western" pattern, and a "prudent" pattern. A diet heavy in fruits and vegetables is the "prudent" pattern. The "Western" pattern involves consuming more sweets and fewer fruits and vegetables. Most low-nutrient diets follow the "low-consumption mix pattern," which includes a few certain kinds of meat, fish, potatoes, and vegetables. In contrast to the "prudent" model, they found that the "Western" and "low consumer mix" models were linked to a higher incidence of esophageal squamous cell cancer [49].

2) Gastric adenocarcinoma

In Brazil, Stela V. Peres et al. examined the consumption of ultra-processed foods and processed foods in patients with gastric adenocarcinoma. They discovered that eating a range of processed foods, particularly processed foods like yellow cheese, fried fish, processed meat, candy, salty bread, and fried and grilled meat, was independently linked to the risk of developing gastric adenocarcinoma [50].

3) Colorectal Cancer

Using food frequency questionnaires to measure dietary intake in three sizable prospective US cohorts every four years, Lu Wang et al. examined the relationship between colorectal cancer risk and ultra-processed food consumption. They discovered no correlation between the overall consumption of ultra-processed foods and colorectal cancer risk in the female population. However, a high intake of ultra-processed meals was shown to be linked to an elevated risk of colorectal cancer in men and specific subgroups, and future research is required to determine whether ultra-processed foods have any qualities that could contribute to colorectal cancer [51].Using multiple linear regression analysis, Wen Liu et al. sought to investigate the connection between digestive symptoms and the consumption of several food components. According to the study, the primary dietary parameters that affected the prevention of intestinal symptoms in patients following sphincter surgery were protein and fruit consumption, cholesterol, and the relationship between grains and dairy. The perception of irregular bowel movements was negatively connected with fruit consumption, while the perception of aberrant bowel movements was positively connected with the interaction between dairy products and cereals.In order to enhance patients' quality of life and alleviate digestive symptoms, medical professionals can use the findings of this study as a foundation for developing a scientific nutrition education program in the future [52]

3. Cancers of Urinary System

1) Prostate cancer

Researchers Erica Line de Oliveira Pedron et al. looked into how an anti-fermentation diet affected the bodies and food consumption of older prostate cancer patients. According to this study, older patients receiving radiation therapy for prostate cancer have poorer diets and body compositions while following an anti-fermentation diet [53]. Numerous research on the relationship between consumption of plant or animal foods and the risk of prostate cancer have numerous contradictions. According to a literature analysis by John Shin et al., eating more plant-based foods may lower the risk of prostate cancer, whereas eating more dairy products may raise that risk [54].

2) Bladder cancer

The association between food classes and bladder cancer risk was examined by Matteo Di Maso et al. Thus, their study further demonstrated the importance of diet in the etiology of bladder cancer by showing that eating more meat, particularly stewed or roasted meat, increased the chance of developing bladder cancer while consuming fewer vegetables and yogurt/milk [55].

4. Other Cancers

1) Head and neck cancer

Dietary variables play a similar influence in head and neck cancer in East Asian and European populations. Consuming processed meat raises the risk of head and neck cancer, while consuming a lot of fruits and vegetables lowers it [56].

2) Thyroid cancer

Yu-Jin Kwon et al. thoroughly examined the prevalence of thyroid cancer and three iodine-rich dietary groups using a significant amount of Korean population data. The study's main limitations are the absence of 24-hour urine samples (for iodine status assessment) and clinical data (for thyroid cancer diagnosis), despite the fact that their findings imply that a dairy diet may lower the incidence of thyroid cancer in the Korean population and that an adequate intake of seaweed may prevent thyroid cancer [57].

3) Skin cancer

One of the main risk factors for non-melanoma skin cancer, the most prevalent type of cancer among Americans, is exposure to ultraviolet light. Certain dietary reactive oxygen species, which guard against DNA damage and carcinogenesis, have shown great promise in preventing skin cancer in both human and laboratory investigations [58]

4)Cervical cancer

Cervical cancer is a global public health concern and the second largest cause of mortality for of reproductive age globally. A number of factors, including food, influence the likelihood of persistent HPV infection and the growth of tumors. An ecological investigation of food patterns and cervical cancer in a sample of Colombian women aged 35 to 64 was carried out by Luz Adriana Meneses-Urrea et al. In Colombia, having diabetes and using a state-subsidized health care system are linked to an increased risk of cervical cancer. Nonetheless, it has been demonstrated that rural locations and conservative eating patterns are protective factors; these findings highlight the necessity of promoting healthy lifestyles as a public policy [59].

CONCLUSIONS

Fermented foods have been shown to be beneficial against cancer, but UPF raises the chance of developing cancer and is linked to an increased risk of dying. Furthermore, we have discovered

that a number of malignancies, mostly those of the breast, digestive, and urinary systems, are linked to food.

Studies on the relationship between food and cancer have grown dramatically in recent decades, and China's experience with food and medicine homology offers stronger evidence in favor of cancer prevention. Because fermented foods alter the composition of intestinal microbiota and boost immunity, they can enhance overall cancer survival rates while also influencing food safety. Humans rather than mice may still be the subject of future research on fermented foods. Additionally, dietary regulation of the personal microbiome is necessary. However, there is little research on the relationship between eating organic food and the incidence of cancer in general, and the findings on certain cancer risks have been inconsistent. Carefully planned clinical trials are required to assess food products' effects on health in more detail.

The association between UPF intake and breast cancer risk has been the subject of numerous epidemiological research, with varying degrees of success. Generally speaking, more research is required to validate these findings, particularly large prospective cohort studies. Because ultra-processed food consumption is so common, global action to minimize intake is urgently needed to alleviate the cancer burden. All cancer patients should have access to food insecurity assessment and therapies, according to prospective trials. In the future, food safety will play a significant role in the treatment of cancer patients.

Three components make up the process of how diet affects cancer: dietary inflammation, dietary index, and metabolic aspect. In order to grow and multiply more quickly, cancer cells develop a number of metabolic adjustments. Although these metabolic changes aid in regulating metabolism and strengthening antioxidant defenses, they also result in decreased metabolic flexibility and a greater reliance on nutritional absorption, as diet is the primary source of nutrients that promote tumor growth [60]. Tumor-induced hypercatabolism can result in decreased food intake and a worsened nutritional status, which can promote weight loss [61]. The risk of breast cancer in any of the molecular subtypes (luminal, HER2+, or triple-negative patients) was inversely correlated with dietary index [62]. Breast cancer risk is increased by diets that induce inflammation (as measured by a higher dietary inflammation score and dietary inflammation index) [63]

In conclusion, there is a tight relationship between food consumption and cancers, which warrants research into the action mechanism and application approach for improved illness prevention and therapy. The significance and effect of foods on cancer have been discussed in this mini-review. Food recovery techniques for malignancies are being researched and promoted in order to completely utilize the nursing resources of the edible and medicinal homologous foods in China and to integrate them with contemporary science, technology, and research methodologies.

Conflicts of Interest

Regarding the publishing of this paper, the author discloses no conflicts of interest.

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