

UNIVERSITA' DEGLI STUDI DEL PIEMONTE ORIENTALE

Dipartimento di Scienze Della Salute



Master Degree in Medical Biotechnologies

**The Role of a Plant-Based, Antioxidant-Rich Diet in Reducing
Gastric Cancer Risk: A Review of Current Evidence**

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1. Introduction

1. Introduction:

Over the past few decades, rapid globalization, urbanization, and lifestyle transitions have reshaped global health patterns. Chronic noncommunicable diseases, particularly cancers, have emerged as leading causes of death and disability across both developed and developing nations. According to the World Health Organization (WHO, 2020), nearly one in six deaths globally is attributed to cancer, making it one of the most significant public health challenges of the 21st century. Among all malignancies, gastric cancer continues to pose a major threat due to its high incidence and poor prognosis. It ranks fifth in global cancer prevalence and remains the fourth leading cause of cancer-related mortality, with over one million new cases diagnosed annually (The American Journal of Gastroenterology, 2025; WHO, 2020). Despite medical progress, late-stage diagnosis and limited therapeutic success underline the urgent need for preventive approaches that target modifiable risk factors.

Scientific evidence increasingly emphasizes that lifestyle behaviors particularly dietary habits, smoking, alcohol consumption, and physical inactivity play a central role in both the onset and progression of gastric cancer. The American College of Lifestyle Medicine (ACLM, 2025) identifies such behaviors as key determinants of chronic disease risk, noting that lifestyle modification can prevent up to 80% of premature deaths from noncommunicable conditions (Katz et al., 2018). In the context of gastric cancer, these findings suggest that prevention must extend beyond clinical intervention to encompass comprehensive lifestyle-based strategies that promote metabolic balance, reduce inflammation, and strengthen cellular resilience.

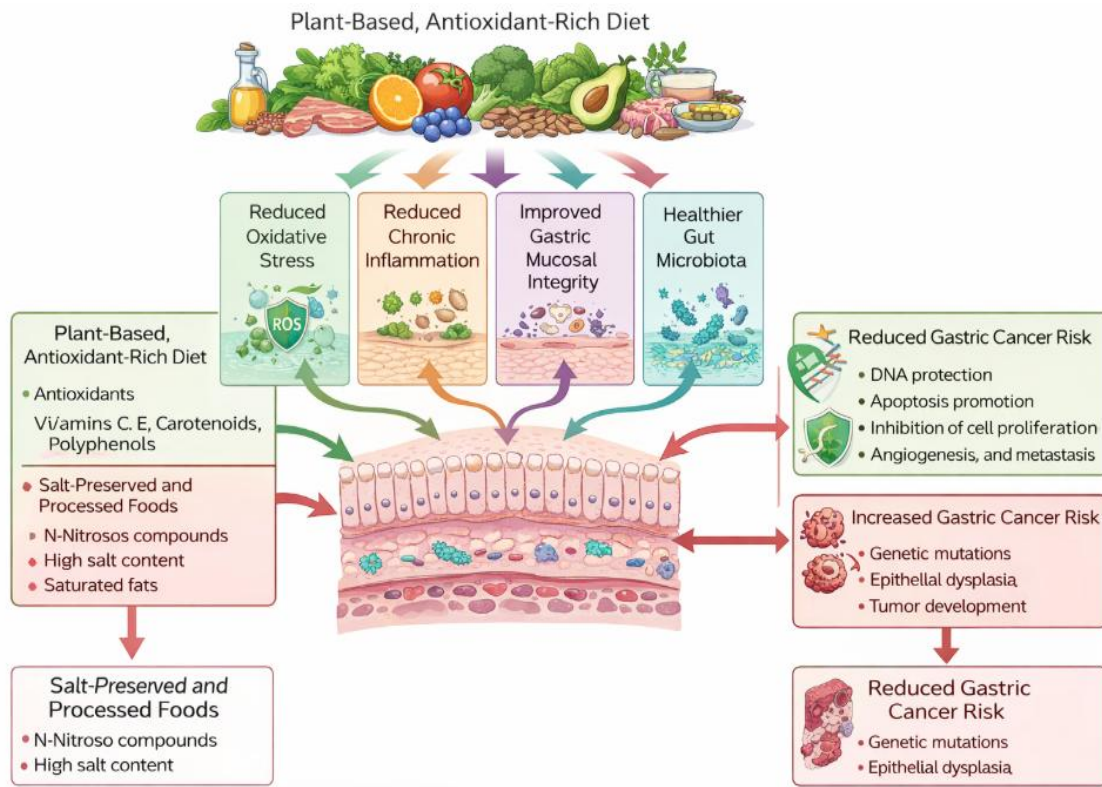
Among all modifiable lifestyle components, diet has received particular attention as a cornerstone of gastric cancer prevention. Dietary patterns that are rich in fruits, vegetables, legumes, whole grains, nuts, and seeds collectively defined as plant-based diets are associated with lower incidence of gastrointestinal malignancies. Such diets are abundant in natural antioxidants including vitamins C and E, carotenoids, polyphenols, and flavonoids, which work synergistically to neutralize reactive oxygen species (ROS) and reduce oxidative stress, a key contributor to gastric carcinogenesis (Walter & Willett, 2017). Conversely, Western style diets high in processed meats, saturated fats, salt preserved foods, and refined sugars have been linked to increased

production of carcinogenic compounds and chronic mucosal inflammation (Wang & He et al., 2022). These opposing dietary effects highlight the critical role of nutrition not merely in sustaining life but in determining long-term disease outcomes.

The integration of these findings aligns closely with the emerging field of Lifestyle Medicine (LM), which focuses on preventing and managing chronic diseases through evidence based behavioral interventions. Unlike conventional medical models that prioritize pharmacological treatment, lifestyle medicine targets the root causes of illness by addressing nutrition, physical activity, sleep quality, stress management, avoidance of risky substances, and social connectedness (Frates et al., 2024; ACLM, 2025). Within this framework, dietary modification particularly the adoption of a plant based, antioxidant rich diet (PBARD) represents a scientifically grounded, accessible, and cost effective approach to reducing gastric cancer risk.

Therefore, this thesis aims to synthesize recent evidence from 2023–2025 exploring how plant based, antioxidant rich dietary patterns contribute to gastric cancer prevention. It will also discuss how these dietary effects intersect with the broader principles of lifestyle medicine to promote systemic health, reduce oxidative stress, and protect gastric mucosal integrity. By integrating research findings across nutrition, epidemiology, and molecular biology, this work underscores the potential of plant-based dietary interventions as a cornerstone for cancer prevention and public health promotion in the modern era.

Figure 1: Mechanistic pathways linking a plant based antioxidant rich diet with reduced gastric cancer risk.



This figure illustrates how plant based, antioxidant rich foods help reduce gastric cancer risk by lowering oxidative stress, reducing inflammation, strengthening mucosal integrity, and supporting a healthy gut microbiota. The diagram contrasts protective dietary components such as vitamins C and E and polyphenols with harmful factors like salt preserved foods and N-nitroso compounds. Source: Created by the author with the assistance of ChatGPT (OpenAI, 2026).

1.1 Lifestyle Medicine

Modern medicine increasingly recognizes that most chronic diseases including cardiovascular disorders, diabetes, obesity, and several forms of cancer are deeply influenced by everyday lifestyle habits. As defined by the American College of Lifestyle Medicine (ACLM, 2025), Lifestyle Medicine (LM) is a clinical discipline that employs therapeutic lifestyle interventions as the primary means of preventing, treating, and even reversing chronic conditions. Rather than addressing disease

symptoms alone, LM focuses on the underlying causes rooted in behavior and environment.

In the context of gastric cancer, this framework provides a preventive lens through which the disease can be understood. Research has shown that lifestyle choices especially smoking, alcohol consumption, physical inactivity, and poor dietary quality are critical determinants of gastric cancer initiation and progression (Katz et al., 2018). By emphasizing modifiable habits, Lifestyle Medicine offers an integrated approach to risk reduction, supporting both individual and population level health.

The central goal of lifestyle medicine is to help individuals adopt and sustain health by promoting behaviors that improve physiological resilience and reduce exposure to carcinogenic stressors. In doing so, it complements conventional medicine by shifting the focus from treatment to prevention. In clinical settings, Lifestyle Medicine practitioners guide patients toward balanced nutrition, regular movement, restorative sleep, stress control, social support, and avoidance of harmful substances factors that collectively enhance immune competence and metabolic homeostasis (Frates et al., 2024).

1.2 Pillars of Lifestyle Medicine

The six core pillars of lifestyle medicine, as described by the ACLM (2025), provide a structured yet holistic framework for promoting health and preventing disease. Each pillar contributes uniquely to gastric cancer prevention by influencing biological pathways such as oxidative stress regulation, inflammation control, and immune function.

1.2.1 Whole Food, Plant Predominant Diet

The foundation of Lifestyle Medicine lies in the adoption of a whole food, plant predominant diet. This pattern emphasizes minimally processed fruits, vegetables, whole grains, legumes, nuts, and seeds foods naturally rich in dietary fiber, antioxidants, and phytochemicals. According to the ACLM (2025), such diets not only prevent chronic diseases but, when applied intensively, can even support remission of existing conditions. In the context of gastric cancer, the high

concentration of antioxidant compounds such as vitamins C and E, carotenoids, and polyphenols helps neutralize free radicals, reduce oxidative stress, and protect the gastric mucosa from DNA damage (Walter & Willett, 2017). Conversely, diets rich in processed meats and salt preserved foods increase exposure to carcinogenic N-nitroso compounds, elevating cancer risk (Babalola & Akinnusi et al., 2025).

1.2.2 Physical Activity

Regular physical activity is a second essential pillar of Lifestyle Medicine. Engaging in at least 150 minutes of moderate intensity exercise per week such as walking, cycling, or swimming supports cardiovascular health, regulates body weight, and enhances immune surveillance (ACLM, 2025). Exercise improves circulation to the gastrointestinal tract, facilitates detoxification, and helps maintain hormonal balance. By lowering chronic inflammation and oxidative stress, it indirectly contributes to a reduced risk of gastric and other cancers.

1.2.3 Restorative Sleep

Adequate sleep is vital for maintaining metabolic and immune stability. The ACLM (2025) recommends 7–9 hours of quality sleep per night for adults. Sleep deprivation is associated with impaired glucose control, elevated cortisol levels, and chronic inflammation all of which may promote carcinogenic processes. Restorative sleep supports cellular repair and strengthens immune defense, forming a natural barrier against disease development.

1.2.4 Stress Management

Chronic psychological stress is known to dysregulate hormonal and immune pathways, contributing to systemic inflammation and oxidative imbalance. Lifestyle medicine emphasizes mindfulness, meditation, yoga, and breathing exercises as evidence-based methods for lowering stress reactivity (ACLM, 2025). Effective stress management fosters emotional well being, stabilizes the hypothalamic-pituitary-adrenal axis, and indirectly supports gastric mucosal protection thereby helping to mitigate the biological conditions that favor carcinogenesis.

1.2.5 Avoidance of Risky Substances

Avoiding tobacco and limiting alcohol intake form another critical component of Lifestyle Medicine. Both substances are well established risk factors for gastric cancer, as documented by the World Health Organization (2025). Tobacco smoke introduces carcinogenic compounds that damage DNA and promote gastric mucosal mutations, while excessive alcohol consumption increases oxidative stress and disrupts epithelial integrity. The LM approach integrates behavioral counseling and social support to facilitate cessation, thereby reducing exposure to these harmful agents.

1.2.6 Positive Social Connections

The final pillar highlights the influence of social connection on overall health. The WHO (2025) and the ACLM (2025) note that loneliness and social isolation significantly elevate the risk of premature mortality and chronic disease, effects comparable to those of smoking or obesity. Strong social relationships foster emotional stability, lower stress hormones, and may even modulate inflammatory and immune responses. Supportive interpersonal networks thus play an indirect yet meaningful role in enhancing resilience and promoting cancer prevention.

1.3 Diet and Gastric Cancer Risk

Diet stands as one of the most influential and modifiable determinants of health. According to the World Health Organization (2020), a healthy diet protects against malnutrition in all its forms and lowers the risk of noncommunicable diseases, including diabetes, cardiovascular disease, and various cancers. Within this framework, the foods consumed daily influence not only short-term wellbeing but also the long-term development of chronic illnesses such as gastric cancer. The composition, quality, and preparation of dietary intake can either maintain the integrity of the gastric mucosa or contribute to its damage, setting the stage for malignancy.

Nutritional epidemiology consistently demonstrates that diets rich in whole grains, fruits, vegetables, legumes, and nuts are associated with a decreased risk of gastric and other gastrointestinal cancers, likely driven by anti-inflammatory and antioxidant

effects of phytochemicals and fiber (Bertuccio et al., 2013). Conversely, diets characterized by processed meats, refined carbohydrates, and high salt or fat content typical of Western dietary patterns may promote gastric carcinogenesis. Mechanisms include the formation of carcinogenic compounds such as N-nitroso compounds and heterocyclic amines during meat processing and high temperature cooking, which induce oxidative stress and DNA damage within gastric epithelial cells, impairing repair and regenerative processes (Seyyedsalehi et al., 2023).

Beyond their direct chemical effects, dietary habits influence biological pathways associated with cancer development, including oxidative stress, inflammation, and microbial balance. For instance, excess fat and sugar intake alter metabolic regulation, promote the overproduction of reactive oxygen species (ROS), and weaken the antioxidant defense system (Ruban et al., 2025). Over time, these processes lead to the loss of gastric barrier integrity and create a microenvironment favorable for malignant transformation.

By contrast, antioxidant rich diets act protectively through multiple mechanisms. Nutrients such as vitamins C and E, carotenoids, and polyphenols neutralize ROS and prevent lipid peroxidation, thereby stabilizing cellular membranes and maintaining normal gene expression (Walter & Willett, 2017; Harvard T.H. Chan School of Public Health). Vitamin C, in particular, has been shown to inhibit the formation of *N-nitroso* compounds in the stomach, a recognized pathway of gastric carcinogenesis. Moreover, these plant-derived antioxidants enhance immune surveillance, modulate inflammatory cytokines, and support DNA repair processes.

Dietary habits influence biological pathways associated with cancer development, including oxidative stress, inflammation, and microbial balance. For instance, excess fat and sugar intake alter metabolic regulation and promote an imbalance in gut microbial communities. A diverse and balanced microbial environment contributes to detoxification of harmful compounds, regulation of local inflammation, and maintenance of epithelial integrity, whereas poor dietary patterns disrupt this balance, leading to dysbiosis a condition associated with chronic gastritis and higher cancer risk (Huo et al., 2025).

1.4 Plant-Based, Antioxidant Rich Diet (PBARD): Components and Mechanisms

A plant based, antioxidant rich diet has gained increasing attention as a practical and evidence supported strategy for disease prevention. The American College of Lifestyle Medicine (ACLM, 2025) identifies a whole food, plant predominant eating pattern as a therapeutic foundation for preventing and even reversing chronic disease. This dietary approach prioritizes minimally processed fruits, vegetables, legumes, whole grains, nuts, and seeds that are naturally abundant in fiber, micronutrients, and bioactive compounds. Together, these foods nurture physiological balance by lowering inflammation, neutralizing oxidative stress, and protecting cellular structures from degeneration all of which are critical for preventing gastric mucosal injury and malignant transformation.

According to Harvard T.H. Chan School of Public Health (2017), the Harvard Healthy Eating Plate illustrates a practical approach to healthy eating built largely around plant-based foods. This model, developed under the guidance of Dr. Walter Willett, encourages the inclusion of plant derived foods while limiting refined carbohydrates, red and processed meats, and sodium. The resulting nutritional profile is inherently rich in antioxidants such as vitamins C and E, carotenoids, and polyphenols that collectively neutralize free radicals and stabilize cellular membranes. These compounds modulate inflammatory pathways, support DNA repair, and strengthen the gastric barrier, thereby reducing the likelihood of oxidative injury and carcinogenesis.

Fruits and vegetables serve as the nutritional core of PBARD, supplying phytochemicals that exert both antioxidant and anti-inflammatory effects. Cruciferous vegetables such as broccoli, cabbage, and kale contain glucosinolates that are metabolized into isothiocyanates compounds known to inhibit carcinogenic activity by modulating oxidative and inflammatory pathways. Similarly, tomato-based foods provide antioxidants including lycopene, β -carotene, and lutein, which help suppress tumor growth and promote cellular stability. In parallel, whole grains and legumes including oats, quinoa, lentils, and chickpeas contribute plant proteins and fermentable fibers that act as prebiotics, fostering a diverse and stable gut microbial

community. The fermentation of these fibers produces short chain fatty acids that strengthen epithelial integrity, regulate immune responses, and reduce chronic inflammation, thereby lowering gastric cancer susceptibility (Chen et al., 2025; Tomova et al., 2019).

Healthy plant fats also form an integral component of PBARD. Nuts, seeds, and oils derived from plants particularly olive and avocado oils supply unsaturated fatty acids and vitamin E that maintain cellular membrane stability and reduce lipid peroxidation. Replacing animal fats with these plant sources has been associated with lower oxidative stress and improved metabolic health (Walter & Willett, 2017). Moreover, minimizing the intake of salt preserved, smoked, or pickled foods helps prevent the endogenous formation of carcinogenic *N-nitroso* compounds, which are recognized contributors to gastric tumor development (Wang & He et al., 2022).

The protective actions of this dietary pattern operate through several interrelated biological pathways. Diets rich in plant-based foods provide an abundance of antioxidants, particularly vitamins C and E, that play a crucial role in reducing oxidative stress by neutralizing reactive oxygen species capable of damaging DNA and initiating carcinogenic mutations. According to Kong et al. (2014), higher dietary intake of antioxidant vitamins is significantly associated with a lower risk of gastric cancer, largely due to their ability to inhibit the intragastric formation of N-nitroso compounds and support DNA repair mechanisms. These micronutrients also strengthen epithelial integrity and maintain a balanced gastric environment, contributing to the prevention of malignant transformation. Importantly, these protective effects arise not from isolated nutrient supplementation but from the synergistic interaction of vitamins and phytochemicals naturally present in whole foods, emphasizing the value of a diet grounded in diverse, minimally processed plant sources.

1.5 Background on Gastric Cancer

Cancer is characterized by uncontrolled and excessive cell proliferation that disregards normal physiological boundaries. Among the many types of malignancies affecting the digestive system, gastric cancer (GC) remains one of the most prevalent and deadly forms. It arises primarily from the glandular epithelial cells of the stomach

lining, leading to the development of gastric adenocarcinoma, which constitutes the majority of gastric cancer cases. Less commonly, non-epithelial tumors such as gastrointestinal stromal tumors (GISTs) originate from the interstitial cells of Cajal located in the muscular layer of the stomach. Because of their distinct cellular origins, adenocarcinomas and GISTs differ in biological behavior, clinical presentation, and treatment response (Yamamoto & Hamada, 2012).

Gastric cancer typically develops over several years through a multistep process that involves chronic inflammation, genetic mutations, and environmental exposures. Factors such as infection with *Helicobacter pylori*, high intake of salt preserved or smoked foods, tobacco use, alcohol consumption, and physical inactivity contribute significantly to its development (Wang & He et al., 2022). These exposures lead to continuous irritation and oxidative damage of the gastric mucosa, eventually triggering the transformation of normal epithelial cells into dysplastic and malignant forms.

According to current gastroenterology literature, gastric cancer is generally classified into two main anatomical types cardia and non-cardia gastric cancer based on tumor location within the stomach, with non-cardia disease being far more common and more strongly associated with *Helicobacter pylori* infection and dietary carcinogens, whereas cardia cancer is more frequently linked to obesity and gastroesophageal reflux disease. Gastric cancer continues to represent a major global health burden it ranks among the top five most frequently diagnosed malignancies worldwide and remains one of the leading causes of cancer related death, with an estimated ~1.1 million new cases and ~770 000 deaths in 2020 according to the Global Cancer Observatory (GLOBOCAN) database, showing considerably higher incidence and mortality in Eastern Asia compared with other regions (Song et al., 2022). Geographic differences in incidence reflect the influence of local dietary habits, infection prevalence, socioeconomic status, and access to healthcare. Despite declines in age standardized incidence and mortality rates over recent decades, the absolute number of cases and disability adjusted life years (DALYs) remains high, particularly among older populations and males, who consistently show incidence and mortality rates roughly two times those of females (Song et al., 2022; Ilic, 2022). These disparities may be influenced by hormonal and behavioral factors, as well as differential

exposure to risk factors like smoking and diet. A major challenge in controlling gastric cancer lies in its often silent progression; early-stage disease is typically asymptomatic or presents with vague symptoms that mimic benign conditions, leading to delayed diagnosis and advanced disease at presentation. These realities highlight the critical importance of preventive strategies, particularly those focusing on modifiable risk factors such as diet and lifestyle. In this context, understanding how dietary choices influence the biological mechanisms of gastric carcinogenesis is essential. The next section will therefore explore the role of diet and nutrition in the development of gastric cancer, emphasizing the molecular pathways through which certain foods increase or decrease cancer risk.

1.6 The Role of Diet and Nutrition in Gastric Carcinogenesis

The development of gastric cancer is a complex, multifactorial process influenced by genetic predisposition, environmental exposures, and, importantly, dietary habits. Among all modifiable risk factors, diet occupies a central position because it affects multiple physiological systems that collectively determine gastric health. Long term dietary patterns can either preserve the integrity of the gastric mucosa or contribute to chronic irritation, inflammation, and oxidative stress, which initiate and sustain carcinogenic changes within the stomach lining.

Large evidence syntheses indicate that diets high in salt, pickled foods, and processed meat are associated with elevated gastric cancer risk. In particular, high dietary salt intake has been linked with increased gastric cancer incidence in multiple population studies, likely due to salt's ability to irritate the gastric mucosa, disrupt protective barriers, and potentiate damage from other carcinogens (Wu et al., 2022).

Dietary carcinogens generated during high temperature cooking of meats such as heterocyclic amines (HCAs) and polycyclic aromatic hydrocarbons (PAHs) are also implicated in gastric tumorigenesis by inducing DNA damage and promoting oxidative stress and inflammation. Meta analytic evidence supports this association: higher consumption of red and processed meat is significantly associated with increased gastric cancer risk (Kim et al., 2019).

Conversely, diets rich in fruits, vegetables, whole grains, and nuts containing antioxidants and anti-inflammatory phytochemicals have been associated with reduced gastric cancer risk, suggesting a protective role for plant-based nutrition.

1.7 Dietary Risk and Protective Factors

Dietary patterns have long been recognized as key environmental determinants in the development or prevention of gastric cancer. Epidemiological studies consistently show that the quality, composition, and preparation of food can either heighten carcinogenic exposure or provide significant protection against cellular damage. The balance between these opposing influences largely determines individual and population risk.

Evidence indicates that frequent consumption of processed and red meats, salty foods, and refined carbohydrates is associated with an elevated risk of gastric cancer. High dietary salt intake and processed meat consumption have been shown to increase gastric cancer incidence, primarily by damaging the gastric mucosa, disrupting protective barriers, and promoting inflammation and the formation of carcinogenic compounds (Wu et al., 2021). Excessive salt consumption may also enhance *Helicobacter pylori* colonization and mucosal injury, further compounding the carcinogenic process.

Meta analytic findings confirm that diets high in red and processed meats substantially increase gastric cancer risk, with dose response data showing a clear positive correlation between intake and disease incidence (Zhu et al., 2013). Processed meats such as bacon, sausages, and salted or smoked products contain high concentrations of sodium and nitrites, which are converted into carcinogenic *N-nitroso* compounds in the digestive tract. Similarly, high temperature cooking methods produce heterocyclic amines (HCAs) and polycyclic aromatic hydrocarbons (PAHs) that can directly damage gastric epithelial DNA and induce oxidative stress.

In contrast, numerous studies highlight the protective effects of diets rich in fruits, vegetables, legumes, and whole grains. These plant-based dietary patterns supply antioxidants and anti-inflammatory compounds that neutralize free radicals, reduce oxidative stress, and maintain mucosal integrity. Kong et al. (2014) demonstrated that

high intake of vitamins A, C, and E significantly reduced gastric cancer risk, particularly among individuals consuming fewer processed or salted foods. These nutrients preserve epithelial stability, inhibit N-nitroso compound formation, and enhance DNA repair mechanisms.

Further support for the protective role of antioxidant-rich diets comes from Kermanshahi et al. (2023), who conducted a comprehensive meta-analysis showing that greater fruit and vegetable consumption is associated with a significantly lower risk of gastric cancer. The study emphasized that cruciferous vegetables, citrus fruits, and fiber rich plant foods contribute to both antioxidant and anti-inflammatory effects that mitigate gastric carcinogenesis.

Collectively, these findings highlight that diet exerts both harmful and protective effects through overlapping biological mechanisms. High salt, high fat, and heavily processed foods damage gastric mucosal cells, promote chronic inflammation, and facilitate endogenous carcinogen formation. Conversely, plant based, antioxidant rich diets reduce oxidative stress, suppress inflammatory signaling, and preserve epithelial barrier function. The cumulative result is a measurable reduction in gastric cancer incidence among populations adhering to predominantly plant centered eating patterns.

Moreover, these dietary effects often interact with other lifestyle factors such as smoking, alcohol use, and physical inactivity, amplifying or mitigating overall risk. Alcohol and tobacco act synergistically with poor diet to increase oxidative injury and DNA mutations within gastric tissue, while the protective influence of a plant based diet is further enhanced when combined with regular physical activity, stress management, and adequate sleep, which strengthen immune and metabolic resilience.

Therefore, the relationship between diet and gastric cancer risk is not merely determined by individual nutrients but by holistic dietary patterns integrated with broader lifestyle behaviors. Diets dominated by natural, minimally processed plant foods consistently demonstrate protective benefits, whereas those reliant on processed, salted, or animal based foods elevate carcinogenic potential. These observations provide a scientific foundation for public health recommendations advocating the adoption of plant based, antioxidant rich dietary habits as a core preventive measure against gastric cancer.

1.8 Interaction Between Helicobacter pylori Infection and Diet

One of the most important factors in the pathogenesis of gastric cancer is infection with *Helicobacter pylori*, a Gram-negative bacterium that colonizes the stomach lining and triggers chronic inflammation. Classified as a Group 1 carcinogen by the World Health Organization, *H. pylori* infects more than half of the global population, though prevalence varies widely across regions and socioeconomic conditions. The bacterium promotes gastric carcinogenesis through mechanisms involving oxidative stress, epithelial injury, and persistent immune activation. However, recent research demonstrates that dietary patterns can significantly modulate the impact of *H. pylori*, either exacerbating or mitigating its pathogenic effects (Habbash & Ali, 2022).

Diets rich in salt, smoked products, and processed meats exacerbate infection related damage by intensifying gastric inflammation and promoting the endogenous formation of carcinogenic N-nitroso compounds. Excess salt and nitrite exposure weakens the gastric mucosal barrier and enhances bacterial colonization, accelerating the transition from chronic gastritis to precancerous lesions. Conversely, plant based diets abundant in antioxidants particularly fruits, vegetables, legumes, and whole grains help buffer the gastric lining against bacterial induced oxidative stress and inflammation.

Nutrients such as vitamins C and E, β -carotene, and selenium play crucial roles in counteracting oxidative injury and modulating immune responses during *H. pylori* infection. Zhao et al. (2022) reported that individuals with higher antioxidant vitamin intake had a markedly lower prevalence of *H. pylori* infection. Vitamin C in particular helps neutralize reactive oxygen species generated during bacterial colonization and inhibits the conversion of dietary nitrates into carcinogenic nitrosamines, thereby reducing mutagenic exposure within the stomach. These antioxidants also enhance epithelial repair and may weaken bacterial virulence through immune modulation.

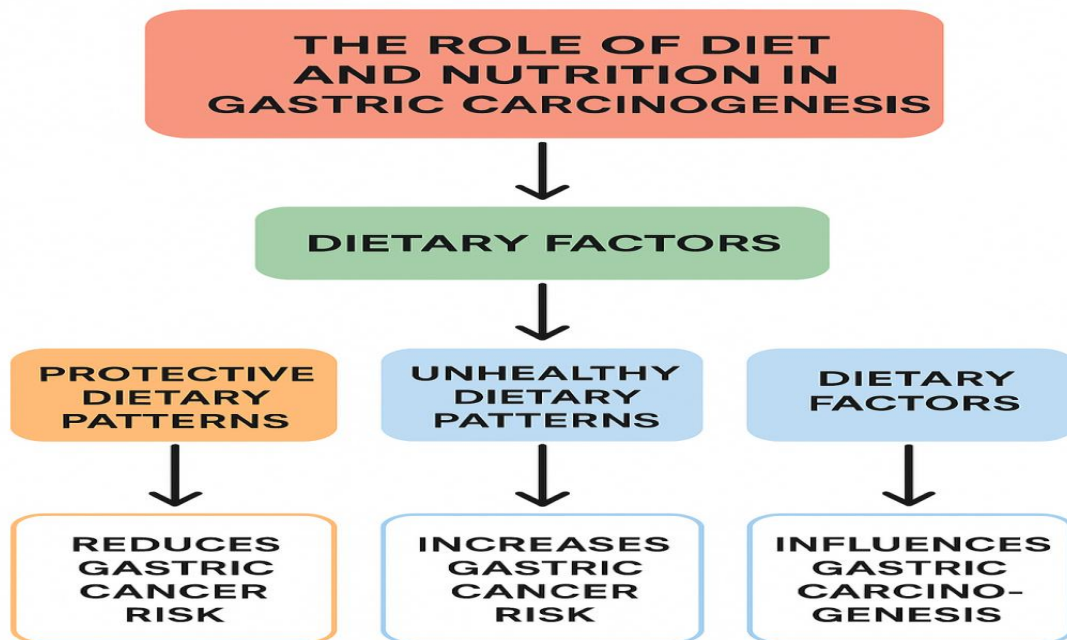
Moreover, Habbash and Ali (2022) found that diets high in salty, fatty, or processed foods are strongly associated with increased *H. pylori* infection risk, while fruit and vegetable rich diets correlate with significantly lower infection rates. Their findings highlight the dual dietary influence foods that foster gastric inflammation versus those

that confer antioxidant protection which ultimately shapes how *H. pylori* affects gastric health.

Dietary composition further influences *H. pylori* persistence indirectly by shaping the gastric and gut microbiota. A balanced microbial ecosystem supported by fiber rich and polyphenol containing foods restricts pathogenic overgrowth and fosters production of short chain fatty acids that reinforce mucosal integrity. In contrast, high fat, low fiber diets promote dysbiosis, which compromises epithelial defense and sustains chronic inflammation that favors *H. pylori* survival.

In summary, while *Helicobacter pylori* remain one of the strongest independent risk factors for gastric cancer, its pathogenicity is profoundly influenced by diet. Salt preserved and processed foods amplify bacterial toxicity and mucosal damage, whereas antioxidant rich, plant-based diets reduce oxidative stress, regulate immune responses, and sustain microbial balance. These findings emphasize that nutritional strategies should accompany medical eradication therapies forming a dual approach that integrates antibiotic treatment with lifestyle based dietary reform to effectively prevent *H. pylori* related gastric carcinogenesis (Habbash & Ali, 2022; Zhao et al., 2022).

Figure 2: How different dietary patterns and nutrients contribute to or protect against the development of gastric cancer.



This figure illustrates how dietary choices influence gastric cancer risk. Protective dietary patterns rich in antioxidants, fiber, and plant-based foods help reduce risk by minimizing oxidative stress and inflammation, while unhealthy patterns high in salt, processed foods, and saturated fats promote carcinogenic processes. Source: Created by the author with the assistance of ChatGPT (OpenAI, 2026).

1.9 News of the Week:

Communicating science in a way that reaches everyone is often as important as the research itself. Recognizing this need, the University launched the *News of the Week* initiative to make scientific knowledge more accessible to the public. Although science and technology continue to evolve rapidly, many people still struggle to grasp complex scientific or medical ideas. This communication gap frequently contributes to confusion, misinformation, and a weak connection between researchers and the community.

The project works to bridge this divide by turning technical scientific findings into accurate, easy to understand information. Each week, a relevant health or science

topic is carefully selected, using trusted scientific databases. The information gathered is then refined into clear, concise, and reliable content that non specialists can easily follow.

To maximize its reach, the project shares these summaries through social media platforms and dedicated web pages. Beyond simply informing the public, *News of the Week* seeks to inspire awareness, encourage responsible health decisions, and promote trust in scientific discovery. By translating research into relatable knowledge, the initiative supports the growth of a society that values evidence, embraces innovation, and understands the real world benefits of scientific progress.

2.Objective of The Thesis

The aim of this thesis is to review current scientific evidence to identify and evaluate the role of plant based, antioxidant rich diets in the prevention of gastric cancer. Specifically, the study examines how different dietary patterns influence gastric cancer risk through mechanisms involving oxidative stress reduction, inflammation control, and mucosal protection. This objective aligns with the implementation of the “News of the Week” initiative, which seeks to connect current scientific evidence with public understanding. By translating research findings into accessible and trustworthy information, this work contributes to promoting informed dietary choices and improving public health literacy.

This study further contributes to the broader mission of the Public Health Laboratory to strengthen scientific literacy and encourage the application of research in daily life. Academically, it offers a systematic and evidence-based analysis of contemporary literature, while from a communication perspective, it demonstrates how sophisticated medical and nutritional information can be simplified and disseminated to support health awareness and behavioral change. Ultimately, the study aims to deepen the understanding of how dietary antioxidants and plant derived nutrients contribute to gastric cancer prevention and to reinforce the importance of diet centered interventions in public health strategies.

3. MATERIALS AND METHODS

3.1 Search Strategy

A comprehensive and structured literature search was conducted to identify relevant scientific studies examining the relationship between antioxidant rich, plant based dietary patterns and gastric cancer risk. Two major databases, PubMed and Scopus, were systematically searched due to their extensive coverage of biomedical, clinical, and nutritional research. The search strategy incorporated Medical Subject Headings (MeSH) and relevant free text keywords.

The search was limited to studies published between 2023 and 2025 to ensure inclusion of the most recent and updated research. Only articles published in English and with full-text availability were included for review.

Database	Search String
PubMed	("Stomach Neoplasms" OR "gastric cancer" OR "stomach cancer" OR "gastric carcinoma" OR "stomach neoplasm*" OR "gastric tumor*" OR "stomach tumor*" OR "gastric malignancy*" OR "stomach malignancy*") AND ("Diet" OR "Nutritional Physiological Phenomena" OR "dietary pattern*" OR "nutrition" OR "plant-based" OR "vegetarian" OR "vegan" OR "Mediterranean diet" OR "whole food" OR "healthy diet")
Scopus	(TITLE-ABS-KEY("gastric cancer" OR "stomach neoplasm" OR "gastric carcinoma")) AND (TITLE-ABS-KEY("diet" OR "nutrition" OR "plant-based" OR "vegetarian" OR "vegan" OR "antioxidant" OR "polyphenol" OR "vitamin C" OR "carotenoid")) AND (TITLE-ABS-KEY("risk" OR "prevention" OR "association"))

3.2 Eligibility Criteria

To ensure methodological consistency and relevance, a clear set of inclusion and exclusion criteria was applied. Studies were included if they investigated adult human populations (aged 18 years and older) and examined the relationship between plant-based or antioxidant-rich diets and gastric cancer outcomes. Eligible studies included those focusing on dietary patterns high in fruits, vegetables, legumes, nuts, whole

grains, and other antioxidant rich foods, or those evaluating specific nutrients such as vitamins C and E, carotenoids, and polyphenols.

The review included randomized controlled trials, cohort studies, case-control studies, and systematic reviews published in English and in peer reviewed journals. Studies were excluded if they were not published in English, did not address gastric cancer as an outcome, lacked sufficient methodological detail, or focused on non human or purely mechanistic laboratory research. Studies unrelated to antioxidant rich or plant based diets were also excluded.

The PICO framework was applied to structure the selection process and maintain clarity in identifying relevant studies, as shown below:

PICO	Description
Population (P)	Human adults aged 18 years and older, both sexes, from diverse geographic backgrounds.
Intervention (I)	Plant based, antioxidant rich diets including fruits, vegetables, whole grains, legumes, nuts, and foods high in vitamins C and E, carotenoids, and polyphenols.
Comparison (C)	Standard or Western style diets, or other dietary patterns lower in plant and antioxidant content.
Outcome (O)	Gastric cancer incidence, recurrence, or mortality, including changes in oxidative stress biomarkers or inflammatory markers related to gastric carcinogenesis.

These criteria ensured that the final body of evidence was relevant, recent, and methodologically rigorous, allowing for a comprehensive synthesis of the dietary factors influencing gastric cancer risk.

3.3 Data Extraction

A structured and systematic approach was used to extract data from the included studies. Information collected included author names, publication year, study location, study design, and sample characteristics such as population size, age distribution, and sex ratio. Detailed data regarding dietary exposure were also gathered, focusing on the

type of plant based or antioxidant rich diet analyzed, food components assessed, and measurement tools such as food frequency questionnaires or dietary indices used for quantification.

Outcomes recorded included gastric cancer incidence, recurrence, or mortality, as well as biomarkers reflecting antioxidant activity or oxidative stress levels. Data regarding relevant cofactors such as *Helicobacter pylori* infection, alcohol consumption, and smoking habits were also extracted when reported. This systematic extraction process was managed using a standardized spreadsheet to ensure consistency, accuracy, and reproducibility of results across different studies.

4.RESULTS

4.1 Identification of Studies

The database search identified a total of 1,086 records, including 683 from PubMed and 403 from Scopus. After removal of 273 duplicate records, 813 unique articles were subjected to title and abstract screening. Based on the predefined eligibility criteria, 780 studies were excluded due to irrelevance, inadequate data, or a lack of focus on antioxidant rich or plant based dietary patterns. The remaining 33 articles underwent full text review for eligibility assessment.

Following detailed evaluation, 28 articles were excluded for reasons including insufficient dietary detail, absence of gastric cancer outcomes, non-English publication, or methodological limitations. Ultimately, 5 studies fulfilled all inclusion requirements and were incorporated into the qualitative synthesis.

Figure 3: PRISMA Flowchart of the Included Studies

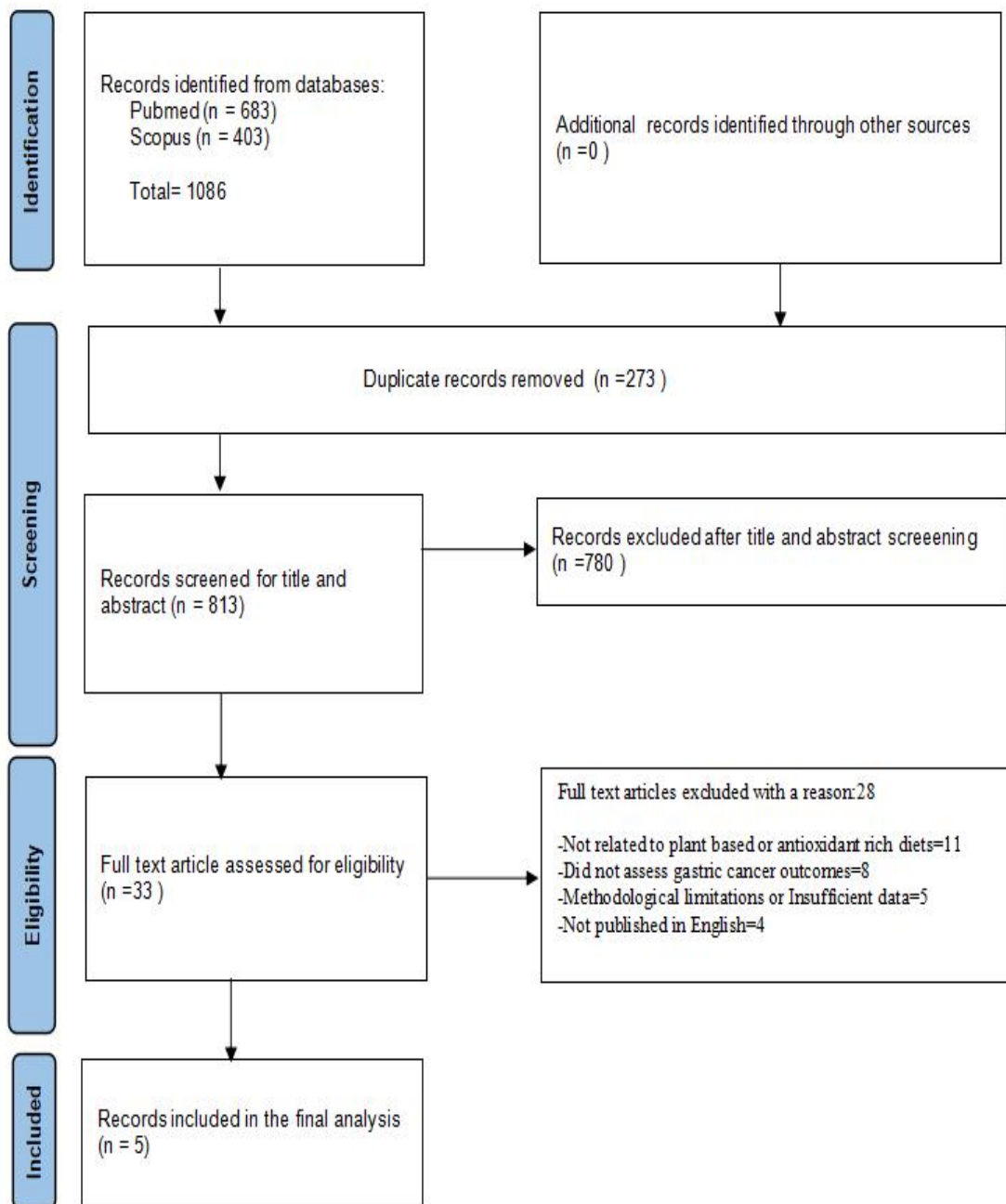


Table 1: General Characteristics of Included Studies

Author(Year)	Country / Region	Study Design	Population (Number, Age and Sex)	Aim and Objective of Research
Kwak et al.(2023)	Korea	Case Control	N = 440 Age = 57 Male = 61% Female = 39%	To evaluate the association between intake of fruits, vegetables, and soy products and gastric cancer risk, particularly among <i>H. pylori</i> infected individuals.
Yu et al.(2024)	China	Prospective Cohort	N = 510,143 Age = 51 Female = 59.2%	To examine whether consumption of preserved vegetables increases the risk of gastric and gastrointestinal cancers. The study aimed to clarify how different preservation methods influence cancer risk.

Liu et al.(2024)	Korea	Case Control	N = 48,306 Age = 58 Male = 53.8% Female = 46.2%	To assess interactions between dietary polyphenol and coffee intake and polygenic risk scores for gastric cancer, identifying potential gene diet relationships.
Collatuzzo et al.(2024)	Multinational (Italy, USA,Russia, Iran, China, Portugal, Spain, Mexico,)	Pooled Case Control (11 studies)	N = 15,491 Age = 63 Male = 62% Female = 38%	To determine the relationship between dietary fiber intake and gastric cancer risk across 11 international studies, distinguishing effects by cancer subtype.
Gonzalez-Palacios et al.(2024)	Multinational	Pooled analysis of Case Control studies	N = 19,900 Age = 60 Male = 60% Female = 40%	To analyze dietary folate intake and its protective role against gastric cancer, exploring potential interaction with alcohol consumption levels.

4.2 General Characteristics of Included Studies

The included studies encompassed diverse designs, including case control, cohort, and pooled analyses, with research conducted across various geographic regions such as East Asia and Southern Europe. Collectively, these studies examined the association between antioxidant rich dietary components such as fruits, vegetables, legumes, and fiber and the risk or progression of gastric cancer. The overall process of study identification and selection is illustrated in Figure 1, which follows the PRISMA framework to ensure methodological transparency and replicability.

The five studies included in this review were published between 2023 and 2024 and collectively represent diverse geographic and methodological contexts. Two investigations originated from Korea (Kwak et al., 2023; Liu et al., 2024), one was an international pooled case-control analysis covering 11 countries (Collatuzzo et al., 2024), another a multi-regional prospective cohort (Yu et al., 2024), and one a European pooled analysis conducted within the StoP Consortium (Gonzalez Palacios et al., 2024). Together, these studies encompass a range of populations varying in age, sex, lifestyle, and exposure to dietary and environmental risk factors for gastric cancer.

Across all investigations, the findings consistently indicated that plant based and antioxidant rich dietary components were associated with a reduced risk of gastric cancer, while higher consumption of preserved or high salt foods was linked to increased risk. Kwak et al. (2023) found that frequent consumption of fresh fruits, vegetables, and soy derived foods significantly lowered gastric cancer odds, especially among *Helicobacter pylori* infected adults, suggesting an important diet infection interaction. Conversely, Yu et al. (2024) reported that high intake of preserved vegetables increased the risk of gastric and gastrointestinal cancers, a finding attributed to nitrosation processes generating carcinogenic N-nitroso compounds. Liu et al. (2024) demonstrated that polyphenol rich diets and regular coffee consumption mitigated genetic susceptibility to gastric cancer, revealing a promising gene diet interplay. The pooled analyses by Collatuzzo et al. (2024) and Gonzalez Palacios et al. (2024) expanded these insights the former confirmed a strong inverse association between dietary fiber intake and gastric cancer risk,

particularly for non-cardia subtypes, while the latter highlighted folate's protective effect, most evident among individuals with low alcohol consumption.

Overall, these studies converge on a consistent message ,diets emphasizing unprocessed, antioxidant dense plant foods rich in fiber, polyphenols, and essential vitamins confer measurable protection against gastric cancer. Conversely, preservation techniques and nutrient deficiencies that elevate oxidative stress appear to heighten risk. This synthesis underscores the multifactorial nature of dietary influence on gastric carcinogenesis and supports ongoing recommendations promoting whole food, plant predominant eating patterns as an evidence based strategy for cancer prevention.

Table 2: Characteristics of Diet and Antioxidant Interventions

Author & Year	Diet Type/ Exposure	Key Antioxidant Components	Main Biological Mechanisms	Observed Outcomes	Implication for Gastric Cancer Risk
Kwak et al. (2023)	Fresh fruits, vegetables, and soy based foods	Vitamins C and E, carotenoids, isoflavones, and polyphenols	Reduced oxidative stress; improved immune response; modulation of inflammation; protection against <i>H. pylori</i> induced gastric	20–30% lower gastric cancer odds, stronger protective effect among <i>H. pylori</i> positive participants	Antioxidant rich plant foods show a strong inverse association with gastric cancer risk, supporting their protective role through anti-inflammatory and detoxifying effects

Collatuzzo et al. (2024)	Dietary fiber intake	Fiber, complex carbohydrates, prebiotic polysaccharides.	Enhances gut microbiota balance; increases short-chain fatty acid (SCFA) production; reduces chronic inflammation and improves mucosal barrier	15–25% lower gastric cancer risk; stronger association for non-cardia gastric cancers	Dietary fiber confers protection through gut mediated mechanisms that limit inflammation and promote mucosal integrity
Yu et al. (2024)	Preserved and salted vegetables	High sodium content, nitrates, and nitrites	Nitrosation pathway activation leading to N-nitroso compound formation; oxidative DNA damage	Increased gastric and GI cancer risk with dose response trend	Preservation methods introduce carcinogenic compounds that counteract the protective potential of plant foods; highlights the distinction between fresh and preserved vegetables.

Liu et al. (2024)	Polyphenol- and coffee rich diet	Polyphenols, chlorogenic acids, flavonoids	Antioxidant and anti-inflammatory activity; modulation of gene diet interactions; reduction of oxidative DNA damage	Reduced genetic susceptibility and attenuated polygenic risk; lower gastric cancer odds in high risk individuals	Polyphenol intake mitigates genetic predisposition, supporting personalized nutrition approaches for cancer prevention.
Gonzalez Palacios et al. (2024)	Dietary folate intake	Folate (vitamin B9)	Supports DNA synthesis and repair; reduces oxidative damage; modulates methylation and alcohol metabolism	Protective association, strongest in low alcohol consumers; dose response effect observed	Adequate folate intake, particularly in low alcohol contexts, plays a preventive role in gastric carcinogenesis through DNA stabilization and methylation control.

4.3 Relationship Between Diet, Antioxidant Mechanisms, and Gastric Cancer Prevention

4.3.1 Antioxidant and Dietary Outcomes

Across the five included studies Kwak et al. (2023), Yu et al. (2024), Liu et al. (2024), Collatuzzo et al. (2024), and Gonzalez-Palacios et al. (2024) the evidence consistently indicates that antioxidant-rich, plant-based dietary patterns are associated with lower gastric cancer risk. Diets emphasizing fruits, vegetables, soy, and whole grains were repeatedly linked with reduced incidence, whereas the consumption of preserved or salted vegetables showed the opposite effect. These findings confirm that dietary quality, rather than simply plant-food presence, determines cancer related outcomes.

Plant foods supply bioactive compounds such as polyphenols, carotenoids, vitamins C and E, and isoflavones, which neutralize reactive oxygen species, limit nitrosation, and enhance mucosal protection. In Kwak et al. (2023), fruit and soy based diets lowered gastric cancer odds by 20–30 %, with stronger protection among *H. pylori* positive participants. Conversely, Yu et al. (2024) found that preserved vegetables increased risk, emphasizing the carcinogenic potential of dietary nitrates converted to N-nitroso compounds in the stomach.

4.3.2 Biological and Physical Health Outcomes

Biological outcomes across studies reveal that dietary fiber, polyphenols, and folate contribute to gastric mucosal integrity and reduce systemic inflammation. Collatuzzo et al. (2024) demonstrated that higher fiber intake correlated with 15-25 % lower gastric cancer risk, particularly for non cardia tumors. The mechanism involves improved bowel transit, microbial fermentation to short chain fatty acids, and strengthened epithelial defense. Polyphenol and coffee rich diets (Liu et al., 2024) further provided antioxidative and anti inflammatory protection by reducing oxidative DNA damage and promoting detoxification enzyme activity. Folate intake, as shown by Gonzalez Palacios et al. (2024), supported DNA repair and methylation balance, providing measurable protection most evident among low alcohol consumers.

4.3.3 Genetic and Metabolic Interactions

A notable finding across this body of evidence is the interaction between diet and genetic predisposition. Liu et al. (2024) identified that polyphenol consumption significantly reduced the heightened risk among individuals with high polygenic risk scores for gastric cancer. This observation underscores the potential of antioxidant-rich foods to mitigate inherited vulnerabilities through modulation of oxidative stress pathways and gene expression.

Such nutrigenomic interactions indicate that dietary interventions may complement personalized medicine strategies. Nutrients such as polyphenols, vitamins, and fibers influence metabolic networks involved in inflammation, DNA repair, and cell cycle regulation. The gene diet synergy demonstrated in recent analyses paves the way for precision nutrition approaches in cancer prevention.

4.3.4 Overall Relationship Between Plant-Based Diets and Gastric Cancer Risk

Overall, the evidence establishes a consistent inverse relationship between whole food, antioxidant rich dietary patterns and gastric cancer incidence. High consumption of fresh plant foods, fiber, and micronutrient dense ingredients protects against oxidative stress and inflammation, while processed or preserved foods increase carcinogenic exposure. The biological plausibility of these associations is supported by mechanisms involving nitrosation inhibition, improved antioxidant defense, DNA repair enhancement, and modulation of gut associated immune responses. These convergent findings highlight plant based diets as a practical and evidence driven approach to reducing gastric cancer risk and improving population health outcomes.

5.DISCUSSION

This review summarizes recent evidence on how plant based, antioxidant rich diets influence the risk of gastric cancer. Overall, the five studies reviewed those by Kwak et al. (2023), Yu et al. (2024), Liu et al. (2024), Collatuzzo et al. (2024), and Gonzalez-Palacios et al. (2024) point in the same direction: people who eat more fruits, vegetables, legumes, soy products, and fiber tend to have a lower risk of gastric cancer, while those who rely on preserved or highly processed plant foods appear to have an increased risk. These findings reinforce the idea that it is not only the presence of plant foods in the diet that matters but also their freshness, level of processing, and antioxidant content.

Kwak et al. (2023) observed that regular intake of fruit, vegetables, and soy-based foods was linked with a 20–30 % reduction in gastric cancer odds, particularly among individuals infected with *Helicobacter pylori*. This result fits well with earlier meta analyses by Kermanshahi et al. (2023) and Kong et al. (2014), which also found protective effects of antioxidant rich foods. Together, these studies suggest that vitamins C and E, carotenoids, and polyphenols play a central role in neutralizing reactive oxygen species and preventing DNA damage in the gastric mucosa. In contrast, Yu et al. (2024) reported higher gastric cancer risk in those consuming preserved vegetables, echoing findings by Wu et al. (2022) and Seyyedsalehi et al. (2023) showing that high salt and nitrate intake can promote the formation of carcinogenic *N*-nitroso compounds. The comparison between fresh and preserved vegetables highlights a key point the way foods are prepared and stored can determine whether they protect or harm the stomach lining.

Collatuzzo et al. (2024) provided further evidence for the benefits of dietary fiber, noting a 15–25 % lower risk of gastric cancer, particularly for non-cardia tumors. Fiber may act through several mechanisms improving bowel transit, supporting healthy microbiota, and producing short-chain fatty acids that help control inflammation and strengthen the mucosal barrier. These effects align with observations by Chen et al. (2025) and Tomova et al. (2019) that high fiber diets promote a diverse microbiome that reduces oxidative stress and supports gastrointestinal health. Such findings broaden the discussion beyond antioxidants alone and point to the microbiome as an important mediator between diet and cancer prevention.

Adding a genetic dimension, Liu et al. (2024) showed that diets rich in polyphenols and coffee compounds can offset inherited susceptibility to gastric cancer. Their data suggest that antioxidants influence gene expression involved in inflammation and DNA repair, offering protection even among individuals with higher genetic risk scores. Similar mechanisms have been described by Rodríguez-García et al. (2019) and Ruban (2025), who highlighted how polyphenols modulate detoxification enzymes and cellular defense pathways. This consistency across molecular and population studies strengthens the idea that nutrition can be tailored to genetic background.

The work of Gonzalez-Palacios et al. (2024) adds yet another layer by emphasizing folate's preventive role, especially in people with low alcohol consumption. Folate supports DNA synthesis and methylation, maintaining genomic stability. The interaction with alcohol intake observed in their pooled analysis is biologically plausible, since alcohol interferes with folate metabolism and may intensify oxidative stress (Rodríguez-García et al., 2019). When viewed together, the studies on fiber, polyphenols, and folate indicate that these nutrients act in concert by reducing inflammation, stabilizing genetic material, and reinforcing mucosal defenses.

Overall, the five studies converge on the conclusion that fresh, antioxidant rich plant foods are protective, while preserved or heavily processed products increase gastric cancer risk. The differences between these two dietary profiles underline the importance of food quality and preparation methods, as previously noted by Bertuccio et al. (2013) and Wang and He (2024). The consistency of the protective associations across both Asian and European populations also suggests that the biological mechanisms are universal, even if local eating habits vary.

Expanding research beyond East Asian and Mediterranean populations will help clarify how local dietary customs interact with broader dietary and environmental mechanisms influencing gastric cancer risk

In summary, this review shows that plant-based diets rich in natural antioxidants can substantially reduce gastric cancer risk through multiple, interlinked pathways lowering oxidative stress, supporting the gut microbiota, protecting epithelial integrity, and stabilizing genetic function. The collective evidence moves beyond descriptive

observation toward a coherent model explaining how diet influences gastric carcinogenesis. Importantly, not all plant foods are equally beneficial; preservation techniques, salt content, and overall dietary balance must be considered when forming nutrition guidelines.

The synthesized results from recent research across different populations and methodologies highlight a growing consensus that dietary habits are central to gastric cancer prevention and emphasize the value of integrating evidence-based nutritional strategies into clinical and public health practice.

5.1 Strengths and Limitations of the Study

This systematic review demonstrates several important strengths. It synthesizes evidence from five recent and high-quality studies published between 2023 and 2025, covering diverse populations and research designs. The inclusion of both cohort and case control studies ranging from a large population-based prospective study conducted across multiple regions of China (Yu et al., 2024) to international pooled analyses within the StoP Consortium (Collatuzzo et al., 2024; Gonzalez-Palacios et al., 2024) provides a broad and current overview of dietary influences on gastric cancer. The studies collectively represent different geographic and cultural dietary contexts, including East Asia and Southern Europe, thereby improving the general relevance of the findings. In addition, the review followed the PRISMA framework, ensuring transparent identification, screening, and inclusion processes that strengthen its methodological credibility. The use of the PICO (Population, Intervention, Comparison, and Outcome) framework further enhanced the clarity and focus of study selection, allowing consistent assessment of how specific dietary patterns relate to gastric cancer risk.

However, some limitations must be acknowledged. The included studies varied in design, population characteristics, and dietary assessment approaches, which may introduce heterogeneity and limit direct comparability of their findings. Because all five investigations were observational, their results cannot establish causality. Differences in how dietary exposures were categorized such as variations in defining plant-based foods, antioxidant-rich diets, or preserved vegetable intake may have contributed to the inconsistencies observed across studies. These differences reflect

regional variations in dietary habits and research methodology rather than contradictions in overall trends. Furthermore, as a qualitative synthesis, this review describes patterns and relationships rather than performing a pooled quantitative analysis. Finally, the inclusion of only English language and recently published studies may have excluded relevant earlier research.

In summary, while the results should be interpreted with these limitations in mind, the consistency of evidence across geographically and methodologically diverse studies strengthens confidence in the conclusion that plant-based antioxidant-rich diets are protective against gastric cancer, whereas preserved and high-salt foods are associated with increased risk.

6.Future Direction

Future research on plant based, antioxidant rich diets and gastric cancer prevention must move beyond isolated nutrient analysis and embrace comprehensive, longitudinal, and multi-centered investigation. Current evidence demonstrates clear associations between dietary antioxidants and reduced cancer risk, but the field still lacks robust causal confirmation and mechanistic precision. Large scale studies involving ethnically and geographically diverse populations are needed to evaluate long term dietary patterns, genetic predispositions, and environmental exposures simultaneously. By combining genomic, metabolomic, and microbiome profiling, future investigations can clarify how individual differences shape responses to dietary antioxidants, unveiling the biological pathways that mediate protection against gastric carcinogenesis.

A critical priority for forthcoming research is to distinguish protective from harmful plant based food sources. While fresh fruits, vegetables, and legumes provide essential vitamins, polyphenols, and carotenoids with proven antioxidant capacity, preserved or salted products introduce nitrosation compounds that can promote carcinogenesis. Thus, defining the boundary between beneficial and detrimental plant derived foods will refine dietary recommendations and guide culturally appropriate prevention strategies tailored to specific populations.

Equally important is the translation of scientific evidence into community level practice. Interdisciplinary collaboration among universities, hospitals, and public health agencies is necessary to transform laboratory findings into sustainable, real world interventions. Educational initiatives such as the lifestyle medicine model developed at the University of Eastern Piedmont exemplify how complex nutritional science can be effectively communicated to the public. Such programs should be expanded internationally to foster public understanding of antioxidant mechanisms, empowering individuals to make informed dietary choices that protect gastric health.

Policy integration is another cornerstone for progress. Policymakers should embed antioxidant science into national dietary guidelines, promoting fiber and polyphenol rich foods through menus adapted for schools, hospitals, and elder care facilities. These initiatives can bridge the gap between academic research and population wide impact, ensuring equitable access to evidence-based nutrition.

Moreover, innovation within the food and biotechnology sectors should be stimulated to develop safe, affordable, and functional foods naturally enriched with antioxidants. Industry collaboration can accelerate the creation of next generation dietary solutions that are both accessible and culturally adaptable. Evaluating these products efficacy and acceptability in real world settings particularly among vulnerable or high risk populations will be vital to achieving sustainable public health outcomes.

Collectively, these directions form a cohesive roadmap toward bridging the divide between research and practice. By strengthening evidence through longitudinal trials, integrating omics technologies, empowering education, guiding national policy, and fostering responsible innovation, the scientific community can ensure that dietary strategies for gastric cancer prevention are not confined to the laboratory but reach those who need them most. In doing so, nutrition will continue to evolve from an individual lifestyle choice into a cornerstone of global cancer prevention and public wellbeing.

Figure 4: Future Direction

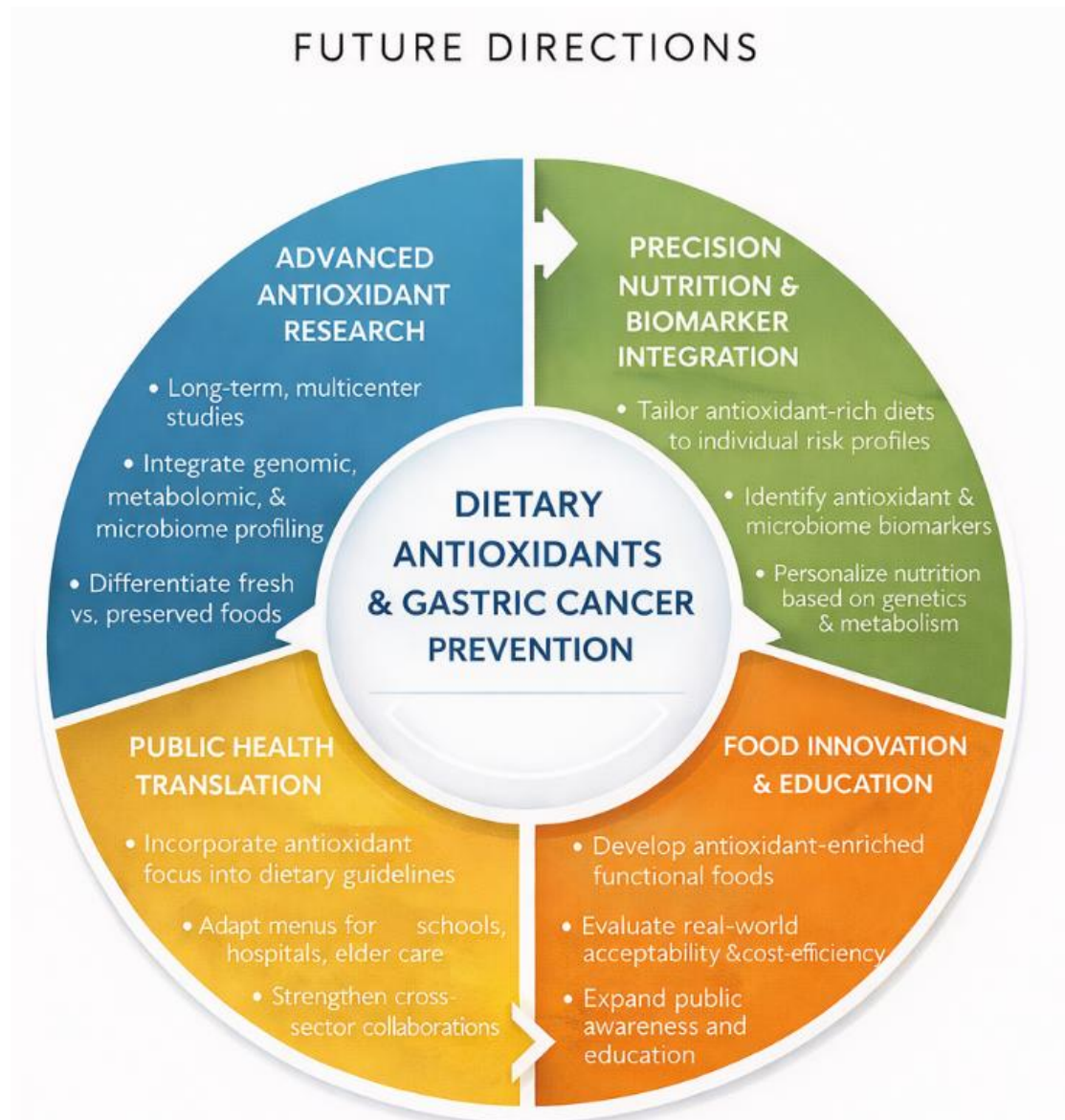


Diagram illustrating the primary future directions in dietary antioxidants and gastric cancer prevention research. These include advancing long-term antioxidant research, developing personalized nutrition and biomarker-based interventions, translating findings into public health practice, and fostering innovation in antioxidant-enriched food development and education. Source: Created by the author with the assistance of ChatGPT (OpenAI, 2026).

7. Conclusion

This review demonstrates that antioxidant rich, plant based diets play a pivotal role in mitigating gastric cancer risk. Regular consumption of fruits, vegetables, whole grains, soy products, and fiber dense foods, alongside adequate folate and polyphenol intake, contributes to the maintenance of gastric mucosal integrity, modulation of inflammatory pathways, and limitation of carcinogenic nitrosation processes. In contrast, high intake of preserved, salted, or processed plant products may elevate risk through the formation of reactive nitrogen species, oxidative stress, and other chemical mechanisms that compromise gastric tissue homeostasis.

The synthesis of recent evidence from 2023 to 2025 confirms that plant-centered dietary patterns represent a safe, sustainable, and effective approach for the prevention of gastric cancer. Across the five reviewed studies, diets rich in fruits, vegetables, legumes, fiber, and other antioxidant-dense foods consistently demonstrated protective effects, while the consumption of preserved or highly processed vegetables was associated with increased cancer risk. These dietary approaches collectively strengthen antioxidant defenses, support a balanced gastrointestinal microbiota, and reduce cumulative exposure to dietary carcinogens.

Overall, the findings emphasize that maintaining a diet based on fresh, minimally processed plant foods can significantly contribute to lowering the global burden of gastric cancer and improving population health.

Future translation of these insights into public health policy, clinical guidelines, and educational programs will be essential to promote broader adoption of protective dietary practices. Through coordinated efforts spanning research, healthcare, and community outreach, antioxidant-rich, plant-based diets can not only reduce the global burden of gastric cancer but also enhance overall health, longevity, and quality of life across diverse populations.

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