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(REVIEW ARTICLE)

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Investigating the effect of dietary routines and lifestyle on gastric cancer risk: A narrative review

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Abstract

Background: Gastric cancer remains a major global health problem and is considered a leading cause of cancer-related mortality. Although the incidence of gastric cancer has decreased in some regions, the burden of disease remains significant, particularly in areas with a high prevalence of gastric cancer.

Objective: This narrative review consolidates evidence on the influence of diet, lifestyle factors, educational level, family history of cancer, Helicobacter pylori infection, body mass index, and chronic digestive diseases on the risk of developing gastric cancer. The aim of the review is to provide recommendations based on evidence for public health strategies and identify avenues for future research.

Methods: This narrative review was conducted by synthesizing results from observational studies, clinical trials, and meta-analyses. Data were extracted from PubMed, Scopus and Google Scholar and focused on studies published between 2000 and 2024.

Results: High consumption of salted meat and smoking significantly increase the risk of stomach cancer, while a diet rich in fruits and vegetables and adherence to the Mediterranean diet provide protective benefits. H. pylori infection and an increased body mass index further worsen the risk, especially in combination with unhealthy eating habits. Quitting smoking and reducing alcohol consumption have been shown to reduce the risk of stomach cancer.

Conclusion: Modifiable factors such as dietary habits and lifestyle are critical to prevent stomach cancer.

Keywords: Gastric Cancer; Dietary Factors; Lifestyle Risks; Helicobacter Pylori

1. Introduction

Gastric cancer (GC) continues to pose a serious threat to global health and is consistently among the leading causes of cancer-related mortality. Despite a decline in incidence rates in certain regions, the global burden of GC remains high, with some areas reporting stable or even increasing rates. In 2020, GC caused approximately 1.089 million new cases and 0.769 million deaths, making it the fifth most common cancer and the fourth most common cause of cancer-related death worldwide. Global age-standardized incidence and mortality rates for GC were 11.1 and 7.7 per 100,000, respectively, highlighting the wide geographic variation in prevalence [1]. Noncardiac and cardiac gastric cancer are the two main subtypes of GC, and each have unique risk factors. Helicobacter pylori infection, which accounts for approximately 89 percent of cases, is closely associated with noncardiac GC. Conversely, obesity and gastroesophageal reflux disease (GERD) are the main causes of Cardia GC. These risk factors have contributed to altering the prevalence

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trends of these subtypes over time, particularly in high-incidence areas [2]. Geographically, GC is distributed differently; South America, East Asia and Eastern Europe have the highest incidence rates, while North America and some parts of Africa have lower rates. The prevalence of H, dietary habits and socioeconomic factors all influence this variation. pylori infection. The disease burden is further increased by additional risk factors such as excessive salt consumption, smoked foods, smoking and alcohol consumption. Approximately 10% of GC cases are caused by a genetic predisposition, but a diet rich in fruits and vegetables has been shown to have a protective effect [3]. Due to its aggressive nature and frequent late-stage diagnosis, GC still has a poor prognosis despite advances in diagnostic and therapeutic approaches. Although new developments such as targeted treatments, immunotherapy and improved diagnostic technologies are promising, their use is currently limited to certain genetic subtypes. To reduce the risk and increase survival rates, preventive measures such as dietary changes, smoking cessation, regular physical activity and genetic testing are essential. Nationwide screening initiatives such as Japan's effective model demonstrate the importance of early detection in reducing mortality [4].

Infections, lifestyle choices, and dietary habits are all modifiable risk factors that contribute significantly to the etiology of GC. Low consumption of fruits and vegetables and high consumption of processed and salted foods are closely linked to an increased risk of disease. Lifestyle choices like drinking alcohol and smoking increase this risk even more. In addition, infections such as H. GC are largely caused by H. pylori, obesity as measured by increased body mass index (BMI), and chronic digestive disorders [3]. The evidence supporting the importance of dietary practices and lifestyle factors such as educational attainment, family history of cancer, and H is brought together in this narrative review. GC risk factors include pylori infection, BMI, and chronic digestive disorders. By emphasizing these critical elements, the review attempts to identify important areas for further research while offering evidence-based suggestions for prevention and treatment.

2. Methodology

This methodology provided a comprehensive understanding of the complex interactions between dietary and lifestyle factors and gastric cancer risk. A systematic literature search was carried out on the most important databases: PubMed, Google Scholar. The search terms included combinations of keywords such as “stomach cancer,” “dietary habits,” “lifestyle factors,” “smoking,” “alcohol consumption,” “nutritional epidemiology,” “cancer prevention,” “family history of cancer.” “Helicobacter pylori infection,” “body mass index (BMI),” and “chronic digestive diseases.” Filters were applied to limit results to peer-reviewed articles in English published between 2000 and 2024. Inclusion criteria focused on peer-reviewed research examining the association between dietary and lifestyle factors and gastric cancer risk. Studies eligible for inclusion included original research, systematic reviews, and meta-analyses. Key variables of interest included dietary factors (e.g. high salt consumption, processed meats, fruits, vegetables), lifestyle factors (e.g. smoking, alcohol consumption, physical activity), as well as education level, family history of cancer and Helicobacter pylori infections, BMI and chronic digestive diseases. Studies with adult populations (aged 18 years and older) were included. Non-peer-reviewed sources such as editorials and opinion articles were excluded, as were studies that focused exclusively on genetic or other non-modifiable risk factors.

Data extraction was carried out systematically and the results were categorized into several topic areas: Nutritional risk factors: e.g. E.g. high salt consumption, processed meat, nutritional protective factors: e.g. B. Fruit, vegetables, whole grain products, lifestyle factors: e.g. e.g. smoking, alcohol consumption, physical activity Other risk factors: e.g. B. Education level, family history of cancer, Helicobacter pylori infection, BMI, chronic digestive diseases. Most significant for comparative analysis. The results were summarized in tables and figures. To integrate the results of different studies and identify trends in dietary and lifestyle factors affecting gastric cancer risk, a qualitative synthesis of the extracted data was performed. The study was conducted according to a planned schedule. Between October 2024 and January 2025, literature search, data extraction, data analysis, manuscript preparation and submission preparation were completed.

3. Results and discussion

3.1. Dietary Risk Factors

Data from 26 prospective cohort studies involving 4,956,350 participants – including 19,301 cases of stomach cancer and 2,871 deaths from the disease – were included in this analysis. The results showed that both high and moderate salt consumption were associated with a higher risk of stomach cancer. Specifically, a relative risk (RR) of 1.25 (95 percent CI: 1.10-1.41) was associated with high salt intake, while an RR of 1.20 (95 percent CI: 1.04 –1.38) was associated with moderate salt intake. Likewise, moderate consumption of pickled foods had no discernible effects (RR: 1.10; 95 percent

CI: 0.88–1.37), whereas high consumption was associated with a significantly higher risk (RR: 1.28; 95 percent CI: 1.05–1.57). Although no significant association was found with moderate consumption (RR: 1.01; 95 percent CI: 1.03-1.49), consumption of processed meat also increased the risk of stomach cancer (RR: 1.24; 95 percent -CI: 1.03–1.49). CI: 0-92-11 points. On the other hand, neither high nor moderate consumption of miso soup was found to have any discernible effects on the risk of stomach cancer. In general, eating a lot of salt, pickled foods and processed meats has been found to significantly increase the risk of stomach cancer [5]. A high-salt diet has been identified as an important environmental factor that interacts with Helicobacter pylori infection and increases the risk of gastric cancer. Excessive salt consumption can worsen the damage to the stomach lining, promote infection with H. pylori and accelerate the carcinogenic process. This interaction potentially increases inflammation and thus contributes to the development of cancer. In addition to its direct effects on the stomach lining, high salt consumption may interact with genetic susceptibility and other environmental risk factors, further increasing the risk of stomach cancer [6]. Processed meat is another dietary factor strongly linked to an increased risk of cancer. This meat contains sodium nitrite, which reacts with broken down protein fragments during digestion to form cancer-causing N-nitroso compounds (NOCs). Unlike vegetables, which also contain nitrates and nitrites, processed meat is rich in heme - a molecule that, when combined with nitrites, facilitates the formation of NOC. Vegetables, on the other hand, contain antioxidants such as vitamins C and E, which inhibit NOC formation and therefore have a protective effect against cancer. Additionally, frying processed meats like bacon increases both NOC production and tumor promotion, which increases the risk of cancer [7]. A meta-analysis of 60 observational studies examined the association between pickled vegetable consumption and stomach cancer risk. The results suggest a potential 50% increased risk, with stronger associations observed in Korea and China. Case-control studies showed a pooled odds ratio (OR) of 1.56, while cohort studies showed an OR of 1.32, highlighting significant regional differences. Higher risks were found particularly in Korean (OR: 1.89) and Chinese countries.

3.2. Protective Dietary Factors

Dietary factors play an important role in preventing stomach cancer. Certain foods and dietary habits have been shown to reduce the risk of stomach cancer by providing antioxidant benefits, controlling cell proliferation, and inhibiting the growth of cancer cells. Citrus fruits, along with their flavonoids such as hesperetin and naringenin as well as vitamin C, have shown strong protective effects against stomach cancer. These compounds exert their effects by providing antioxidant benefits that protect against oxidative damage that contributes to cancer development. Vegetables, especially cruciferous vegetables, are also known to reduce the risk of stomach cancer as they are rich in essential nutrients and phytochemicals that have positive effects on maintaining health and preventing cancer. Retinol (vitamin A) and its derivatives help reduce the risk of cancer by regulating cell proliferation, which plays a key role in cancer development. Wine, especially red wine, is another protective factor that contains antioxidants like resveratrol. Resveratrol may help inhibit Helicobacter pylori, a bacterium linked to stomach cancer, providing additional protection against the development of stomach cancer. Following the Mediterranean diet, which emphasizes vegetables, legumes, and fish, it has also been shown to reduce the risk of stomach cancer [8]. A study conducted at the Korean Multi-Center Cancer Cohort (KMCC) involving 19,688 participants found that frequent consumption of soybeans/tofu was significantly associated with a reduced risk of stomach cancer. After adjustment for various confounding factors, a significant risk reduction was observed, particularly in women (relative risk (RR) = 0.41). Although men also had a lower risk with high soy/tofu consumption, the reduction was not statistically significant. No interaction was found between soybean/tofu intake and cigarette smoking on stomach cancer risk, suggesting that soybean/tofu consumption may help reduce the risk of stomach cancer [11]. In another study that examined coffee consumption and gastric cancer incidence/mortality in the highest consumption countries, an inverse linear correlation was found between coffee consumption and gastric cancer incidence and mortality. This ecological study, using the Spearman correlation coefficient and data from 25 countries, suggests that coffee may have beneficial effects in reducing the risk and mortality of gastric cancer [12]. A study examining eating habits in Korea found two key patterns: “Westernized” and “prudent.” The “prudent” pattern, characterized by high consumption of vegetables and fruits, was inversely associated with stomach cancer risk. Greater adherence to this pattern was associated with a lower risk of stomach cancer, suggesting that a diet rich in vegetables and fruits may help reduce the risk of stomach cancer [14]. A systematic review and meta-analysis of 16 studies examined the influence of dietary habits on the risk of stomach cancer.

3.3. Lifestyle Risk Factors

Lifestyle factors such as smoking and alcohol consumption contribute significantly to the risk of stomach cancer. Smoking in particular increases the risk in men, with the effect being increased in combination with a Helicobacter pylori (H. pylori) infection. Heavy alcohol consumption damages the stomach lining, leads to chronic inflammation and promotes the development of cancer. Gastric cancer continues to pose a global health burden, with the highest incidence observed in East Asia, Eastern Europe and South America. This is significantly influenced by dietary habits, socioeconomic factors and the prevalence of H. pylori. Although some high-income countries have seen a decline in gastric cancer rates, the global burden remains significant due to late detection, genetic predisposition and

environmental factors. However, recent advances in targeted therapies, immunotherapies, and improved screening initiatives, such as Japan's successful cancer screening program, promise to reduce mortality and improve patient outcomes [3]. A study conducted in China analyzed the role of lifestyle risk factors in gastrointestinal cancer. In 2011, a significant proportion of colorectal, stomach, esophageal and liver cancers were linked to lifestyle choices, including smoking, high sodium intake and inadequate fruit and vegetable consumption. Although improvements in some risk factors have been observed, others, such as increasing body mass index (BMI), increased red meat consumption and low physical activity, are expected to contribute to an increase in gastrointestinal cancer cases by 2031 contribute. Through an optimal lifestyle, up to half of all gastrointestinal cancers could be prevented by 2031 [21]. The European Prospective Investigation into Cancer and Nutrition (EPIC) cohort study, which included 461,550 participants, found that adopting a healthy lifestyle – defined by not smoking, limiting alcohol consumption, eating a Mediterranean diet and maintaining a healthy weight – significantly reduced stomach cancer (GC) Risk. Participants who scored highest on the Healthy Lifestyle Index experienced a 51% reduction in overall GC risk, a 77% lower risk of cardiac gastric cancer (GCC), and a 47% lower risk of non-cardiac GC. This study suggests that such lifestyle factors could prevent 18.8% of all GC cases and 62.4% of cardia GC cases [22]. An umbrella review (UR) of dietary exposures associated with gastric cancer risk evaluated 49 eligible meta-analyses covering 147 unique dietary factors. The review found positive associations between GC risk and factors such as heavy alcohol consumption, consumption of salted fish and larger waist circumference. Conversely, a healthy lifestyle index was inversely associated with GC risk. In addition, obesity (BMI ≥ 30) was associated with an increased risk of cardia gastric cancer. Most studies included in the review were of moderate to high quality. The results illustrate that maintaining a healthy weight and limiting.

3.4. Prevention Strategies

Preventative measures, including dietary and lifestyle changes, play a crucial role in reducing the incidence of stomach cancer. A Mediterranean diet with lots of fruit, vegetables, whole grain products and olive oil has been proven to significantly reduce the risk of stomach cancer. To further reduce the risk, in addition to a change in diet, lifestyle changes such as quitting smoking and moderate alcohol consumption are essential. Public health initiatives aimed at increasing awareness of these preventive factors are critical to promoting early prevention. Chemoprevention with micronutrients such as ascorbic acid, beta-carotene and alpha tocopherol has also shown promise. A notable study conducted in Linxian, China found that supplementation with these nutrients resulted in a reduction in both stomach cancer incidence and mortality. In addition, folic acid and vitamin C have been found to have a chemo preventive effect in certain studies, although results have been inconsistent in different populations and settings. This highlights the need for further pharmacokinetic research to optimize the use of dietary supplements for cancer prevention [8].

3.5. Limitations of the Review

This review is limited by the narrative design, which lacks statistical analysis to quantify risk factors. Furthermore, reliance on previously published studies introduces potential publication bias.

4. Conclusion

GC remains a significant global health challenge as its burden varies across regions and populations. The disease is influenced by modifiable and non-modifiable risk factors, including dietary habits, lifestyle habits, H. pylori infection, genetic predisposition and environmental factors. High salt consumption, consumption of processed meats and smoking increase the risk, while fruits, vegetables and adherence to the Mediterranean diet have protective effects. Advances in diagnostic technologies, targeted therapies and preventative measures such as screening programs have shown the potential to mitigate the impact of disease, but late-stage diagnosis and limited access to innovation remain barriers.

4.1. Future Directions

To better understand and prevent GC, future research should focus on a few key areas. It is critical to examine the effectiveness of nutritional and lifestyle interventions, particularly those designed for a variety of populations, such as low-income areas with higher disease rates. Furthermore, combining genetic and biomarker-based screening techniques can improve early detection and facilitate the development of tailored treatments. To better understand the complex relationships between dietary practices, lifestyle factors and gastric cancer risk in different international contexts, longitudinal cohort studies are needed. Finally, comparative analyzes of national screening programs such as the Japanese model can provide important information about how effective and scalable preventive measures are in different geographical areas.

Recommendations

Public awareness campaigns emphasize the role that regular exercise, smoking cessation and dietary changes play in reducing the risk of stomach cancer. Governments should consider making screening mandatory for high-risk groups and funding preventive measures such as H. pylori elimination initiatives. Promote educational initiatives for at-risk communities to raise awareness of life-threatening risks and promote better eating habits. The top priority for health care providers should be educating patients about modifiable risk factors, conducting genetic testing in high-risk individuals, and considering chemoprevention as a complementary tactic.

Compliance with ethical standards

Disclosure of conflict of interest

There are no conflicts of interest disclosed by the authors.

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