

## GASTRIC CANCER: CAUSES, CLINICAL MANIFESTATIONS, DIAGNOSTIC APPROACHES, AND MODERN TREATMENT METHODS

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**Abstract:** Gastric cancer is a major global health concern and remains one of the leading causes of cancer-related mortality worldwide. Despite significant progress in medical technology, early diagnosis of gastric cancer is still challenging due to the absence of specific symptoms in the initial stages. The disease develops as a result of complex interactions between genetic susceptibility, environmental exposures, dietary habits, and infectious agents, particularly *Helicobacter pylori*. This article provides an in-depth review of gastric cancer, emphasizing its etiology, risk factors, pathogenesis, clinical manifestations, diagnostic approaches, and modern treatment strategies. Special focus is placed on recent advancements in surgical techniques, chemotherapy regimens, targeted therapy, and immunotherapy. A comprehensive understanding of gastric cancer is essential for early detection, improved therapeutic outcomes, and reduction of disease-related mortality.

**Keywords:** gastric cancer, stomach carcinoma, risk factors, clinical features, diagnosis, modern treatment, oncology.

### Introduction

Gastric cancer, commonly referred to as stomach cancer, is a malignant neoplasm originating from the epithelial cells of the gastric mucosa. It represents a significant burden on global public health, particularly in low- and middle-income countries. According to global cancer statistics, gastric cancer ranks among the top five most frequently diagnosed cancers and is one of the leading causes of cancer-related deaths worldwide.

Although the incidence of gastric cancer has declined in some regions due to improved food preservation, reduced *Helicobacter pylori* prevalence, and better hygiene, the disease continues to be prevalent in East Asia, Eastern Europe, and parts of South America. The prognosis of gastric cancer is closely associated with the stage at diagnosis. While early-stage gastric cancer has a favorable prognosis with appropriate treatment, advanced disease is associated with poor survival rates.

The asymptomatic nature of early gastric cancer and the nonspecific clinical manifestations in later stages contribute to delayed diagnosis. Therefore, understanding the underlying causes, clinical features, diagnostic tools, and modern treatment options is crucial for improving early detection and patient survival. This article aims to provide a detailed and comprehensive overview of gastric cancer suitable for undergraduate medical education.

### 1. Etiology and Risk Factors of Gastric Cancer

The development of gastric cancer is a multistep process involving environmental, infectious, genetic, and lifestyle-related factors.

### **1.1 Helicobacter pylori Infection**

Chronic infection with *Helicobacter pylori* is the most significant known risk factor for gastric cancer. The bacterium induces chronic gastritis, which may progress through stages of atrophic gastritis, intestinal metaplasia, dysplasia, and ultimately carcinoma. Persistent inflammation leads to DNA damage and altered cellular proliferation. The World Health Organization classifies *H. pylori* as a class I carcinogen.

### **1.2 Dietary Factors**

Dietary habits play a major role in gastric carcinogenesis. High consumption of salted, smoked, and pickled foods increases exposure to nitrosamines and other carcinogenic compounds. Conversely, diets rich in fresh fruits, vegetables, and antioxidants such as vitamin C have a protective effect against gastric cancer. Poor food storage methods and lack of refrigeration contribute to increased cancer risk.

### **1.3 Lifestyle and Environmental Factors**

Smoking significantly increases the risk of gastric cancer by promoting oxidative stress and chronic inflammation of the gastric mucosa. Excessive alcohol consumption further damages the gastric lining and exacerbates inflammatory processes. Occupational exposure to coal, metal dust, and asbestos has also been associated with an increased risk of gastric cancer.

### **1.4 Genetic and Hereditary Factors**

Genetic predisposition plays an important role in gastric cancer development. Mutations in the *CDH1* gene are associated with hereditary diffuse gastric cancer. Individuals with a family history of gastric cancer have a higher risk of developing the disease. Certain blood groups, particularly blood group A, have also been linked to increased susceptibility.

## **2. Pathogenesis of Gastric Cancer**

Gastric cancer develops through a complex sequence of molecular and histological changes. Chronic inflammation leads to epithelial damage, increased cellular turnover, and accumulation of genetic mutations. Alterations in tumor suppressor genes, oncogenes, and signaling pathways contribute to malignant transformation. The two main histological types of gastric cancer are intestinal type and diffuse type, each with distinct pathogenetic mechanisms and clinical behavior.

## **3. Clinical Manifestations**

### **3.1 Early Clinical Features**

In the early stages, gastric cancer is often asymptomatic or presents with vague gastrointestinal symptoms such as:

Epigastric discomfort or pain

Indigestion and bloating

Early satiety

Nausea

Mild loss of appetite

These symptoms are frequently misinterpreted as gastritis or peptic ulcer disease.

### **3.2 Advanced Clinical Features**

As the tumor progresses, patients may develop:

Persistent abdominal pain

Significant weight loss

Vomiting and nausea  
Gastrointestinal bleeding (hematemesis, melena)  
Iron-deficiency anemia  
Dysphagia (in proximal tumors)  
Advanced disease may present with palpable abdominal masses, ascites, jaundice, or metastatic lymphadenopathy, including Virchow's node.

#### **4. Diagnostic Approaches**

##### **4.1 Endoscopic Examination**

Upper gastrointestinal endoscopy is the gold standard for gastric cancer diagnosis. It allows direct visualization of lesions and collection of biopsy specimens for histopathological confirmation.

##### **4.2 Imaging Modalities**

Computed tomography (CT) scans are essential for tumor staging and detection of metastases. Endoscopic ultrasound (EUS) provides detailed information on tumor depth and lymph node involvement. Positron emission tomography (PET) assists in identifying distant metastases.

##### **4.3 Laboratory Investigations**

Laboratory tests may reveal anemia and elevated tumor markers such as carcinoembryonic antigen (CEA) and CA 19-9. However, these markers lack specificity and are mainly used for monitoring treatment response.

#### **5. Modern Treatment Strategies**

##### **5.1 Surgical Management**

Surgical resection remains the primary curative treatment for localized gastric cancer. Partial or total gastrectomy combined with regional lymphadenectomy is performed depending on tumor location and extent.

##### **5.2 Chemotherapy**

Chemotherapy is used as neoadjuvant, adjuvant, or palliative treatment. Combination regimens including fluorouracil, cisplatin, oxaliplatin, and docetaxel have improved survival outcomes.

##### **5.3 Radiotherapy**

Radiotherapy is often combined with chemotherapy to enhance local control and reduce recurrence rates in advanced disease.

##### **5.4 Targeted Therapy**

Targeted agents such as trastuzumab are used in HER2-positive gastric cancer, significantly improving survival in selected patients.

##### **5.5 Immunotherapy**

Immune checkpoint inhibitors, including nivolumab and pembrolizumab, represent a major advancement in the treatment of advanced gastric cancer by enhancing the immune response against tumor cells.

#### **6. Prevention and Screening**

Primary prevention includes eradication of *H. pylori*, dietary modifications, smoking cessation, and reduced alcohol consumption. In high-risk populations, endoscopic screening programs have proven effective in early detection and improved survival rates.

#### **Conclusion**

Gastric cancer remains a significant oncological challenge due to its complex etiology, late diagnosis, and high mortality rate. Comprehensive understanding of its risk factors, pathogenesis, clinical features, diagnostic tools, and modern treatment options is essential for effective disease management. Advances in diagnostic technology and therapeutic strategies have improved patient outcomes; however, early detection and prevention remain critical components in reducing the global burden of gastric cancer.

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