(REVIEW ARTICLE)

# The impact of smoking on the digestive system

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## Abstract

Smoking is a well-known risk factor for numerous health conditions, particularly affecting the digestive system. It contributes to a wide range of gastrointestinal (GI) disorders, including peptic ulcers, gastroesophageal reflux disease (GERD), inflammatory bowel disease (IBD), liver diseases, and even gastrointestinal malignancies. This review examines the diverse effects of smoking on the digestive system, highlighting the underlying mechanisms, epidemiological evidence, and potential for prevention through smoking cessation.

**Keywords:** Smoking; Digestive; Stomach; Tobacco and GI

## 1. Introduction

The digestive system plays a critical role in nutrient absorption, immune defense, and maintaining homeostasis. However, various external factors, such as smoking, can impair its function. Smoking introduces over 7,000 chemicals into the body, many of which are toxic or carcinogenic [1]. These chemicals disrupt normal physiological processes, leading to increased susceptibility to diseases throughout the gastrointestinal tract. This review explores the comprehensive impact of smoking on the digestive system, supported by scientific studies and public health data, to underline the need for effective intervention strategies.

## 2. Mechanisms of Smoking-Induced GI Damage

### 2.1. Toxicity of Tobacco Compounds

Tobacco smoke contains harmful substances such as nicotine, carbon monoxide, and nitrosamines. These chemicals induce oxidative stress, alter cellular functions, and damage the mucosal lining of the GI tract [2].

### 2.2. Impaired Blood Flow and Mucosal Protection

Smoking reduces blood flow to the gastrointestinal tissues, impairing nutrient and oxygen delivery. It also decreases the production of mucus and bicarbonate, compromising the protective barrier of the stomach and intestines [3].

### 2.3. Modulation of the Immune System

Smoking alters immune responses, increasing susceptibility to infections like Helicobacter pylori, a major cause of peptic ulcers and gastric cancer [4].

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## 2.4. Gut Microbiome Alterations

Smoking disrupts the gut microbiome, reducing beneficial bacterial populations and promoting dysbiosis. This imbalance contributes to inflammatory conditions such as IBD and colorectal cancer (5).

# 3. Impact on Specific Digestive Disorders

### 3.1. Peptic Ulcer Disease (PUD)

Smoking is a significant risk factor for PUD, primarily by impairing mucosal defenses and promoting Helicobacter pylori infection. A study by new research (6) showed that smokers have a higher risk of ulcer recurrence and delayed healing compared to non-smokers.

### 3.2. Gastroesophageal Reflux Disease (GERD)

Nicotine from smoking relaxes the lower esophageal sphincter, increasing the likelihood of acid reflux. Smokers are also more prone to complications of GERD, such as Barrett's esophagus, a precancerous condition (7).

### 3.3. Inflammatory Bowel Disease (IBD)

The effects of smoking differ between Crohn's disease (CD) and ulcerative colitis (UC). Smoking exacerbates CD by increasing inflammation and reducing treatment efficacy, whereas it appears to have a protective effect against UC, albeit through poorly understood mechanisms (8).

### 3.4. Liver Diseases

Smoking contributes to liver fibrosis, cirrhosis, and hepatocellular carcinoma by exacerbating oxidative stress and impairing liver detoxification functions (9).

### 3.5. Colorectal Cancer (CRC)

Smoking is associated with an increased risk of colorectal adenomas and CRC, particularly in long-term smokers. Nicotine and other carcinogens promote mutagenesis in colonic epithelial cells (10).

# 4. Epidemiological Evidence

### 4.1. Prevalence of GI Disorders Among Smokers

A meta-analysis in recent article revealed highlighted a strong correlation between smoking and GI diseases, with smokers having a 1.5- to 2-fold increased risk of conditions such as GERD, PUD, and CRC compared to non-smokers (11).

### 4.2. Dose-Response Relationship

The risk of GI disorders increases with the intensity and duration of smoking. A longitudinal study by new study, that found that heavy smokers (>20 cigarettes/day) were at a significantly higher risk of developing GI malignancies than light or moderate smokers (12).

### 4.3. Gender and Age Differences

Epidemiological studies indicate that male smokers and older individuals are more susceptible to smoking-related GI conditions, likely due to cumulative exposure and hormonal differences (13).

# 5. Conclusion

Smoking has a profound and multifaceted impact on the digestive system, contributing to the development and progression of numerous GI disorders. Its harmful effects are mediated through direct mucosal damage, immune modulation, and alterations in the gut microbiome. Smoking cessation remains the most effective strategy to mitigate these risks and improve overall gastrointestinal health. Public health initiatives and targeted interventions are essential to combat the global burden of smoking-related digestive diseases.

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