Exploring Herbal Remedies for Peptic Ulcer: A Natural Approach to Gastric Healing

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Abstract

The term "peptic ulcer" (PU) refers to a group of chronic symptoms that affect the mucosal integrity of the stomach and/or duodenal lining and are characterised by pain, perforations, bloating, nausea, blood in the stool or vomit, loss of appetite, and weight loss. The goal of this review is to summaries the various phytoconstituents that have been investigated for their anti-ulcer potential in various preclinical studies. Herbal drugs are alternative remedies for the treatment of various pharmacological conditions and are generally thought to be much safer than synthetic drugs. Recently there has been a growing interest in herbal remedies for their potential efficacy, availability, and safety profile. This review explores the Pathophysiology of peptic ulcers, commonly used herbal treatments, and their mechanisms of action.

Keywords:- Peptic ulcer, Phytomedicine, Herbal drugs, Synthetic drugs, Preclinical studies.

Introduction

A prevalent source of gastrointestinal morbidity and mortality, peptic ulcers (PU) are a collective term for a variety of chronic symptoms that impair the stomach's mucosal integrity and/or the duodenal lining. [1] It is a digestive tract lesion caused by acid that is characterized by denuded mucosa that extends into the muscularis propria or submucosa. [2, 3] Epigastric discomfort, perforations, bloating, nausea, blood in the stool or vomit, appetite reduction, and weight loss are its hallmarks. [4-7] According to estimates, there are 200–250 cases of PU for every 100,000 people worldwide, with developing nations having higher rates. [8] Although PU can begin at any age and affects both sexes equally, the condition often manifests between the ages of 10-15. [9-12]. A key mechanism in the Pathophysiology of the disease is said to be an imbalance between aggressive (free radicals, excess secretion of gastric acid, and pepsin) and defensive (decreased bicarbonate production, prostaglandins (PGs), nitric oxide (NO), and anti-oxidants) factors in the gastric mucosa. [13]**.** Helicobacter pylori infection (H-Pylori), alcohol usage, Zollin-Ellison syndrome, and non-steroidal anti-inflammatory drug use are risk factors for peptic ulcer development. [14]

The World Health Organisation (WHO) estimates that over 80% of people worldwide treat their medical issues with traditional medicine. Since ancient times, herbal products have been used as lead compounds to identify a variety of bioactive chemicals. They are regarded as being far safer than synthetic compounds and are frequently utilized in traditional medical systems to cure a variety of illnesses as well as provide additional health benefits. [15-17]

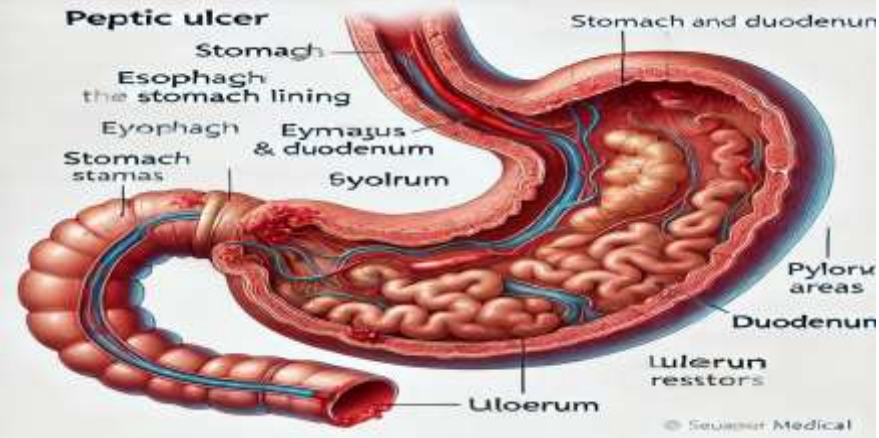

Figure.01. Peptic Ulcer [18]

Herbal medications are being investigated as a viable substitute for synthetic compounds due to the exponential rise in the prevalence of chronic diseases like cancer, diabetes, cardiovascular disorders, ulcerative colitis, and acquired immune deficiency syndrome that necessitate long-term, often lifetime, medication. [19]

Additionally, a number of preclinical and clinical studies have documented the safety and effectiveness of plant-derived products in a variety of pathological disorders in recent decades. [20]

In the United States, antacids and anticholinergics were the primary treatments for peptic ulcers until the late 1970s. Surgery was often required to address the condition [21]. In 1976, histamine-2-receptor antagonists (H2RAs) were first made available. Helicobacter pylori, formerly known as Campylobacter pyloridis, were first identified in stomach biopsies by Dr. J. Robin Warren. [22]

Dr. Barry Marshall cultured H. pylori from ulcer and gastritis patients in 1982. Nevertheless, [23-26]. 1994 National Institutes of Health guidelines did not advocate the use of antibiotics in the therapy for patients with H. pylori-related peptic ulcer disease. There had been a decline in the incidence of peptic ulcer illness by the end of the 20th century. Raising hygiene standards is thought to be the cause of the population's declining H. pylori infection rate [27-28] we emphasise recent developments in treatment approaches and provide an update on the diagnosis of peptic ulcer disease [29].

In 1997, the Centers for Disease Control and Prevention, in collaboration with various government entities, academic institutions, and industry stakeholders, initiated a nationwide educational campaign aimed at raising awareness among healthcare providers and consumers regarding the connection between H. pylori and ulcers

[30]. This initiative emphasized that ulcers are a treatable infection and highlighted the potential for significant health improvements and cost savings through the distribution of information about H. pylori. Later that same year, [31] in a randomized control trial conducted in 2001, Chan *et.al.* Demonstrated that the eradication of H. pylori can prevent bleeding from ulcers induced by aspirin and other non-steroidal anti-inflammatory drugs (NSAIDs) [32].

Conventional treatment approaches

Current antiulcer medications aim to achieve remission as soon as feasible and sustain it for a lengthy period of time, in addition to limiting the disease's progression. [33–35] Histamine-2 receptor antagonists (cimetidine, ranitidine, famotidine, nizatidine); proton pump inhibitors (omeprazole, lansoprazole, pantoprazole, rabeprazole); prostaglandin analogues (misoprostol); antacids (sodium bicarbonate, aluminium hydroxide, magnesium trisilicate); protectants (sucralfate, bismuth); and antimicrobial agents (metronidazole, tetracycline, amoxi cillin, Clarithromycin) are employed in the treatment of PU. [36–41] Iron supplements have also been used to treat PU; they are used in conjunction with aluminium hydroxide to prevent stomach discomfort. [42–44]

Types of peptic ulcer

Peptic ulcers can be divided into categories according to their location.

Gastric ulcer: - It occurrence of the ulcer in stomach.

Duodenal ulcer: - It occurrence of the ulcer in duodenal and intestine

Esophagus ulcer: - It occurrence of the ulcer in esophagus

Aphthous Ulcer:- It is also known as mouth ulcer it occurrence of the ulcer in mouth [45]. Ulcers are many types like Corneal ulcer, Genital ulcer, Liver ulcer and etc. Individuals with this condition demonstrate increased levels of acid secretion. Peptic ulcers are classified according to their severity into two main types: [46].

Acute Peptic Ulcer: These ulcers penetrate to the sub mucosal layer and can manifest as either single or multiple lesions. They are often found in various regions of the stomach and the first few centimeters of the duodenum [47].

Chronic Peptic Ulcer: These ulcers extend through the epithelial and muscular layers of the stomach wall and may affect adjacent organs like the pancreas or liver. In most instances, they appear as solitary ulcers in the pyloric antrum of the stomach and the duodenum [48].

Symptoms of peptic ulcer

Abdominal discomfort is the most common indication of a peptic ulcer, often fluctuating over several days each week. This discomfort typically arises 2 to 3 hours after eating and can also occur at night when the stomach is empty. Other associated symptoms may include blood loss leading to anemia, weight loss, poor appetite, bloating, burping, nausea, and vomiting. In advanced stages, patients may present with severe symptoms, including sharp, sudden, and persistent pain, as well as bloody or black stools and blood in vomit [49].

Complication

Complications associated with peptic ulcer disease can arise from various underlying causes. These complications are significant contributors to the elevated morbidity and mortality rates linked to this condition [50]. The implementation of various gastro protection measures and eradication treatments for Helicobacter pylori infection has notably decreased the incidence of these complications compared to previous decades. Individuals who smoke regularly and those who use chronic NSAIDs are at a higher risk. The four primary complications of peptic ulcer disease include bleeding, perforation, penetration, and obstruction [51].

Bleeding

The occurrence of bleeding has seen a slight reduction in recent years; however, it continues to be the most common complication, affecting around 10-20% of patients. This condition frequently leads to emergency room admissions. Ulcers linked to NSAID usage are more likely to result in bleeding than those caused solely by chronic H. pylori infection [52]. The elderly and individuals with serious health issues, such as respiratory, cardiac, cerebrovascular, and renal conditions, are at the highest risk [53]. It is important to note that 80-90% of upper gastrointestinal hemorrhages are not of variceal origin, with approximately 40-50% resulting from peptic ulcer disease. The mean mortality rate associated with this condition is about 5.5%. Clinical manifestations can vary widely: 15% of patients may experience melena, 30% may have hematemesis, 50% may present with both, and around 5% may show hematochezia due to severe bleeding. In some cases, ulcer bleeding may present as a chronic issue, leading to iron deficiency anemia or a positive fecal occult blood test [54].

Perforation

Perforation occurs in approximately 5% of individuals with peptic ulcers, predominantly affecting 60% of duodenal ulcers, which are typically found on the anterior wall of the duodenal bulb. In contrast, 40% of gastric ulcers often involve the lesser curvature. A free perforation of either a duodenal or gastric ulcer into the peritoneal cavity poses a significant risk to the patient's life [55]. This condition is characterized by sudden, intense abdominal pain in the epigastric region, which may radiate to the back or become diffuse, often accompanied by acute shock, indicating a complicated ulcer perforation with peritonitis. Patients typically adopt a motionless posture with their thighs flexed towards the abdomen, creating an impression of gravity. Upon

examination, a hard, rigid abdomen with rebound tenderness is observed. Initial auscultation may reveal heightened intestinal sounds, which tend to diminish and eventually fade as the condition worsens. Approximately 70% of cases exhibit visible pneumoperitoneum on plain abdominal radiographs [56]. The causes of perforated duodenal ulcers are multifactorial, including alcohol, tobacco, Helicobacter pylori, and notably, the use of NSAIDs, which account for over a third of perforations, with figures reaching up to 50% in the elderly, often involving low-dose acetylsalicylic acid. Chronic cocaine use, although less common, is another potential cause, with its Pathophysiology remaining speculative, possibly linked to localized vasoconstriction or vascular thrombosis. **[57]**

Obstruction

Obstruction is a relatively rare complication, constituting about 5% of ulcer-related issues. Up until around 1970, peptic ulcers were the most common reason for gastric emptying obstruction. In recent years, however, the occurrence of obstruction due to peptic ulcers has decreased, with gastric malignancies now being the leading cause of gastric outlet obstruction [58]. Obstructions caused by ulcers are typically found in the pyloric channel or duodenal bulb, arising from the swelling and edema associated with active ulceration or the healing process, which can lead to the tissue contraction [59].

Etiology & Pathology

The most common causes of PUD (Peptic Ulcer Disease) are H. pylori infection and the use of nonsteroidal anti-inflammatory drugs (NSAIDs), but not everyone who has either of these factors will get the illness. About half of the world's population has the H. pylori bacteria in their stomachs, and most people get infected during childhood, and the infection does not go away unless it is treated. Overcrowding and dirty conditions, along with a lower socioeconomic status, are risk factors for illness. During the past five years, the prevalence of H. pylori has generally decreased. the United States among individuals of all ages. The infection rate varies significantly among ethnic groups; among Mexican Americans, the infection rate is 60%, while among non-Hispanic whites, it is 30% lower. The degeneration and destruction of epithelial cells is caused by the inflammatory response triggered by H. pylori in the stomach's mucosal layer; while it is normal for the antrum to be more inflamed than the corpus, this is not always the case; occasionally the inflammation is more concentrated in the corpus. It is crucial to screen those who have peptic ulcers to ensure they do not carry the H. pylori bacteria. [60]

Herbal products for treatment of PU

Since ancient times, Phytochemical have been utilised to cure a variety of illnesses, and they are generally regarded as safer than synthetic medications. [61-63] they are widely available in nature and apart from therapeutic purposes, they are also consumed in the form of nutritional supplement [64]

Numerous preclinical studies have reported that several chemical constituents derived from plants have anti-ulcer properties. The class of alkaloids, tannins, flavonoids, terpenoids, glycosides, carotenoids, and saponins includes these elements.[65]

In the present manuscript, some of the important medicinal plants and their bioactive principles used for treatment of PU have been discussed. Plant taxonomy as per "The Plant List" has been used to write the names of the plants in this manuscript. [66]

Herbal Treatments for Peptic Ulcers

Cabbage (Brassica oleracea)

Cabbage is rich in glutamine and vitamin U (S-methylmethionine), which promote mucosal repair and reduce gastric acid secretion. Studies suggest daily consumption of cabbage juice accelerates ulcer healing. [67]

Licorice (Glycyrrhiza glabra)

Licorice root enhances mucus secretion and inhibits the growth of H. pylori. Deglycyrrhizinated licorice (DGL) is particularly effective in reducing ulcer symptoms without raising blood pressure. [68]

Aloe Vera (Aloe barbadensis miller)

Aloe vera gel has anti-inflammatory and antioxidant properties, which help in reducing gastric acidity and promoting tissue repair. [69]

Turmeric (Curcuma longa)

Curcumin, the active compound in turmeric, exhibits anti-inflammatory and antibacterial properties. It reduces oxidative stress and inhibits H. pylori growth. [70]

Bananas (Musa spp.)

Bananas contain sitoindosides, which increase mucus secretion and provide a protective barrier against gastric acid. [71]

Neem (Azadirachta indica)

Neem leaves have been shown to reduce gastric acid secretion and promote healing by increasing the production of gastric mucus. [72]

Fenugreek (Trigonella foenum-graecum)

Fenugreek seeds are rich in mucilage, which forms a protective coat on the stomach lining, preventing damage from acid and pepsin. [73]

Plant extracts and phytoconstituents in peptic ulcer

Various medicinal plants are used traditionally in the treatment of peptic ulcer. Plants and Phytomedicine exhibit their action by various mechanisms like antioxidant, cytoprotective, antisecretory action. Some of the plants and their phytoconstituents showing antiulcerogenic activity are tabulated in Table 1

Table 1: Some Medicinal plants having antiulcerogenic activity

Sr. no	Botananical name / family	Traditional uses	Plant part used	Chemical constituent
01.	*Jasminum grandiflorum* Family: Oleaceae	skin diseases, ulcers, wounds, otalgia, leprosy, ottorrhoea, dysmenorrhoea	leaves	alkaloids, saponins, phenolics, flavonoids, carotenoids, glycosides and carbohydrates.[74]
02.	*Solanum nigrum* Family: Solanaceae	liver disorders, skin disease, fevers, inflammatory conditions, painful periods, diarrhoea, eye diseases, ulcer	Fruits	tannins, alkaloids, carbohydrates, saponins, volatile oil and anthocyanins. [75,76]
03.	*Ocimum sanctum* Family: Labiatae	asthma, chronic fever, cold, cough, malaria, dysentery, convulsions, diabetes, diarrhea, arthritis, emetic syndrome etc.	Leaves	eugenol, carvacrol, caryophyllene, apigenin, luteolin, apigenin-7-O-glucuronide, orientin, molludistin and ursolic acid.[77,78]
04.	*Asparagus racemosus* Family: Liliaceae	antispasmodic, astringent, antidiarrhoeatic, antidysentric, useful in tumours, throat infection, leprosy etc.	Root	Total saponins like shatavarin I–IV. [79]
05.	*Amomum subulatum* Family: Zingiberaceae	In gastrointestinal disorders, digestive, stomachic, antiemetic and carminative	Fruit	essential oils, anthocyanins, aurone and flavanone.[80]

Mechanism of Action of Herbal Remedies

Herbal treatments for peptic ulcers work through various mechanisms:

Antibacterial Action: Inhibition of H. pylori.

Anti-inflammatory Properties: Reduction of inflammation and oxidative stress.

Mucosal Protection: Enhancement of mucus and bicarbonate secretion.

Acid Neutralization: Reduction of gastric acid secretion.

Challenges and Limitations

While herbal remedies show potential, challenges such as variability in plant composition, lack of standardization, and insufficient clinical trials remain significant barriers. Further research is needed to validate their efficacy and safety in long-term use.

Conclusion

Herbal remedies provide a natural and holistic approach to managing peptic ulcers. With increasing evidence of their efficacy, these treatments hold promise as an adjunct or alternative to conventional therapies. However, their use should be guided by scientific evidence and medical supervision.

Acknowledgments

I would like to express my sincere gratitude to Dr. Neelam Jain for their invaluable assistance in reviewing and providing constructive feedback on this article. I also appreciate the support of Rama University faculty of pharmaceutical sciences Kanpur for providing the necessary resources to carry out this review.

Ethical consent

This review article does not involve original research involving human participants or animals. Therefore, ethical approval and informed consent were not required.

Conflicts of interest

There are no conflicts of interest.

Future direction

Future prospects in herbal treatment for peptic ulcers include advanced phytochemical research, clinical validation, herbal-drug synergy, innovative delivery systems, personalized herbal medicine, and standardized formulations for regulatory approval.

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