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Diarrhea: Transmission, Pathogenesis, Diagnosis, and Global Impact on Public Health Systems

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Abstract
Diarrheal disease represents a critical global health challenge, ranking as the third leading cause of mortality among infants aged 1-59 months. Despite being both preventable and treatable, this condition continues to impose a substantial burden on pediatric populations worldwide. This study examines the epidemiological impact and preventable nature of diarrheal disease in children, with particular focus on mortality rates and associated risk factors. Analysis of global mortality data and disease burden statistics for pediatric diarrheal infections across different age groups. Current estimates indicate that diarrheal disease accounts for approximately 443,832 deaths annually in children under five years of age, with an additional 50,851 deaths occurring in the 5-9 year age group. The disease affects over 1.7 billion children globally each year, representing a significant public health burden. Diarrheal infections constitute a primary driver of malnutrition in children under five, creating a cycle of increased susceptibility to infectious diseases. The high mortality and morbidity rates associated with paediatric diarrheal disease underscore an urgent need for comprehensive prevention strategies. Evidence demonstrates that a substantial proportion of these infections are preventable through the implementation of safe drinking water access, adequate sanitation infrastructure, and improved hygiene practices. The preventable and treatable nature of this condition, combined with its significant impact on child mortality and nutritional status, highlights the critical importance of targeted public health interventions in reducing the global burden of diarrheal disease in paediatric populations.

Keywords: Diarrhea, Transmission, Pathogenesis, Diagnosis, and Global Impact on Public Health Systems

Introduction

Diarrheal diseases constitute one of the leading causes of morbidity and mortality worldwide, responsible for approximately 1.7 billion cases annually and ranking as the second leading cause of death in children under five years. The World Health Organization estimates that diarrheal diseases account for 525,000 childhood deaths each year (Liang et al., 2025). While oral rehydration therapy remains the cornerstone of treatment, traditional medicinal plants offer complementary therapeutic approaches with established anti-diarrheal properties. Staphylococcus aureus a bacterium is known for producing enterotoxins that can lead to symptoms such as vomiting and diarrhea. This pathogen commonly resides in the nose, throat, skin, and feces of humans, making it a prevalent organism in various environments.

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Cooked meats and starchy foods, particularly those based on potatoes, create favorable conditions for the growth of Staphylococcus aureus (Lemos et al., 2025). These foods can become contaminated during preparation or handling, allowing the bacteria to proliferate.

One of the critical concerns with Staphylococcus aureus is that its enterotoxins are heat-stable, meaning they remain active even after cooking (Shresta et al., 2025). This characteristic poses a significant risk, as food that appears safe after cooking can still cause food borne illness if it has been contaminated with these toxins. Therefore, proper food handling, storage, and hygiene practices are essential to prevent the growth of Staphylococcus aureus and the associated risk of food poisoning (Shyam et al., 2010). This organism frequently contaminates foods of soil origin and dairy products. It causes abdominal cramps and diarrhea, and may also induce vomiting resembling staphylococcal food poisoning. Its spores withstand boiling and can germinate during improper food storage (Granum et al., 1997). Trophozoites are non-infectious outside the host, whereas cysts—transmitted through fecally contaminated water or food—are infectious. Ingested cysts release trophozoites in the colon, where they cause mucosal damage, especially in the cecum, forming flask-shaped ulcers. In some cases, granulomatous masses known as amoebomas may develop, appearing as rectal swellings (Haque et al., 2003).

Giardia lamblia infection results in foul-smelling, loose, and watery stools, often accompanied by abdominal cramps, bloating, and loss of appetite. Clinical features may include fatigue, nausea, increased flatulence, and discomfort in the upper abdomen (epigastric region). Diagnosis typically involves microscopic examination of three separate stool specimens collected at intervals, as cyst excretion may be intermittent. Ideally, these samples should be analyzed within an hour of collection to increase detection accuracy. In certain cases, duodenal aspirates or mucosal biopsies may reveal the presence of the organism. Medicinal plants offer accessible and affordable treatment options, particularly valuable in developing nations where conventional medications may be limited or expensive (Ruiz – Perez et al., 2024). With increasing concerns about antimicrobial resistance, plant-based treatments offer alternative therapeutic approaches that may help reduce reliance on conventional antibiotics. Traditional anti-diarrheal plants can be effectively integrated into primary healthcare systems, providing community-based treatment options while supporting conventional medical care.

Irritable Bowel Syndrome (IBS)

Although abnormalities in gastrointestinal motility have been observed in patients with IBS, these findings are non-specific and do not define the condition. Individuals with diarrhea-dominant IBS often exhibit rapid contractions in the jejunum, faster transit through the small intestine, and more frequent fast-moving and propagated colonic contractions. Conversely, patients with constipation-predominant IBS frequently demonstrate prolonged gastrocecal transit and reduced frequency of high-amplitude propagated contractions within the colon (Wald, 2012).

Levels of Dehydration in Children with Acute Diarrhea No Dehydration

Children without dehydration show normal clinical signs. Skin turgor returns immediately after being pinched, thirst is not excessive, eyes maintain a normal appearance (not sunken), and mental status remains active and alert (Teuta et al., 2015).

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Mild Dehydration

Mild dehydration presents with signs such as irritability or restlessness, a slight delay in skin pinch recovery, increased thirst with eager drinking, and eyes that appear somewhat sunken (Armstrong et al., 2012).

Severe Dehydration

Children experiencing severe dehydration exhibit a marked delay in skin turgor recovery, a reduced desire or inability to drink, deeply sunken eyes, and a noticeable decline in consciousness, often present as lethargy or drowsiness (Levine et al., 2010).

Etiology of Diarrhea

The causes of diarrhea in children span a wide range, including infectious, metabolic, structural, and medication-related origins. The most common infectious agents include:

●Enteroadhesive Escherichia coli

Non-infectious etiologies and contributing factors include:

●Disaccharidase enzyme deficiencies
●Use of laxatives or medications such as lactulose, phenolphthalein, cascara, and senna
●Hormonal imbalances like Zollinger-Ellison syndrome
●Postoperative changes (e.g., partial gastrectomy, blind loop syndrome)
●Malignant conditions including lymphoma, adenocarcinoma, and Kaposi sarcoma
●Intestinal injury due to radiation exposure
●Disorders of the pancreas (e.g., chronic pancreatitis, pancreatic carcinoma)
●Systemic illnesses such as scleroderma, retroperitoneal fibrosis, and sarcoidosis
●Dietary triggers such as excessive sorbitol or laxative use
●Hormone-secreting tumors like VIPomas, carcinoid tumors, and medullary thyroid carcinoma producing calcitonin (Gasparinho et al., 2016)

Host Factors

Several host-related conditions increase susceptibility to diarrheal illness. Chronic malnutrition impairs immune response and gut barrier function, while lactose intolerance may contribute to osmotic diarrhea following dairy intake. A history of repeated diarrheal episodes further weakens intestinal defenses, making the individual more prone to infections and prolonging the duration and severity of illness (Ahmed et al., 2001).

Investigation of Diarrhea

Diagnostic evaluation of diarrhea typically begins with a thorough stool examination. Key parameters include stool consistency, color, and the presence of mucus, pus cells, or parasites. In cases involving visible blood in stool, bacterial culture becomes necessary to identify specific pathogens. To assess systemic effects, particularly dehydration and kidney involvement, laboratory testing of serum electrolytes, urea, and creatinine is conducted. If clinical findings point toward ulcerative colitis, a sigmoidoscopic examination is useful for direct visualization of colonic mucosa to detect inflammation or ulceration (Kato et al., 2011).

Principle of Treatment

Effective management of diarrhea requires addressing both the root cause and systemic complications. The following therapeutic principles are commonly

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applied:
●Immune-supportive agents may be utilized to strengthen host defenses.
●Diaphoretic substances can assist in managing fever by stimulating perspiration.
●Antimicrobials are indicated when a bacterial infection has been confirmed.
●Anti-inflammatory agents are beneficial in cases involving toxin-induced or inflammatory mechanisms.
●Astringents are used to decrease intestinal motility and limit fluid loss.
●For protozoal infections, targeted anti-protozoal therapies—herbal or pharmaceutical—are necessary.
●Gastrointestinal antiseptic herbs may also be employed to lower the microbial burden in the gut (Mulla et al., 2011).

Treatment

Providing appropriate nutritional and fluid support is fundamental in the management of diarrhea. Patients should be encouraged to consume easily digestible foods such as soups, which support hydration and energy intake. Fruit juices can help replenish fluids and glucose. However, during acute diarrheal episodes, it is advisable to avoid caffeinated beverages, alcohol, dairy products, fatty meals, and high-fiber foods, as these may aggravate symptoms and delay recovery by stimulating bowel activity.

Fluid therapy must be tailored according to the severity of dehydration. Generally, fluid replacement ranges between 5 to 200 mL/kg of body weight. In cases where dehydration is severe, intravenous rehydration becomes necessary. Solutions such as normal saline and Ringer's lactate are effective in correcting fluid loss and restoring electrolyte balance (Davies et al., 2001).

Oral Rehydration Therapy (ORT)

ORT remains a critical and universally accepted intervention in the treatment of diarrhea. Its primary objective is to restore fluid and electrolyte balance. The presence of glucose in the solution not only supplies energy but also facilitates sodium and water absorption via the sodium-glucose co-transport mechanism.

In situations where glucose is unavailable, sucrose derived from cane sugar can be substituted, though it does not offer superior benefits. The use of clean, potable water is essential. In communities lacking hygienic water supplies, boiling and cooling water prior to use is recommended. Water drawn from shallow wells is common in rural areas, should be disinfected using bleaching powder to reduce microbial contamination.

In malnourished children, potassium replacement is crucial, as they are at heightened risk for potassium depletion. Sodium bicarbonate is also useful in correcting acidosis, a frequent complication in severe diarrhea. Although bicarbonate absorption during diarrhea may lead to transient mild alkalosis, it is typically of no clinical concern. However, the omission of bicarbonate from the solution can hinder acidosis correction and, in some cases, lead to persistent acid-base imbalance (Davies et al., 2001).

Anti-diarrheal Agents

Gastrointestinal Protectives and Adsorbents

These agents function by exerting local action within the gastrointestinal tract. They either form a protective coating over the mucosal surface or bind to irritants, toxins, and pathogens, thereby mitigating further mucosal irritation and reducing stool output. Notable examples include:
●Bismuth subsalicylate

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●Attapulgite
●Kaolin
●Pectin
Such agents may help reduce the frequency of stools and alleviate discomfort by adsorbing causative toxins and microbes from the intestinal lumen.

Astringents

Astringents are naturally occurring plant-based substances that contain or produce tannic acid. This acid exerts a contracting effect on mucous membranes, helping to reduce intestinal secretions and inflammation. Traditionally used in herbal medicine, astringents help manage mild cases of diarrhea by limiting mucosal fluid loss and enhancing gut integrity. Common examples include:
●Kino
●Krameria
●Catechu
These agents are primarily supportive and symptomatic, particularly valuable in mild, non-infectious diarrheal conditions. Tannins and related polyphenolic compounds provide astringent effects that help reduce excessive fluid secretion, inflammation, and tissue irritation in the gastrointestinal tract.

Anti-motility Drugs

Anti-motility agents work by slowing intestinal peristalsis, which increases the time available for fluid and electrolyte absorption. This mechanism is especially useful for reducing stool frequency in non-severe cases. Certain plant compounds help normalize intestinal motility, reducing excessive peristalsis while maintaining appropriate digestive function.
●Antimuscarinic agents such as atropine, mepenzolate, propantheline, and dicyclomine can relieve spasm-associated diarrhea by blocking muscarinic receptors in the gut.
●Loperamide is a commonly available, over-the-counter agent that reduces intestinal movement and helps decrease the number of stools. However, it should be used with caution, as it does not treat the underlying cause of diarrhea and may worsen certain infections if used inappropriately (Baker, 2007).

Antibiotic Therapy

Targeted antibiotic treatment is reserved for specific infectious causes of diarrhea, based on clinical judgment and laboratory confirmation.
●Metronidazole is considered the treatment of choice for protozoal infections such as amebiasis and giardiasis. It is effective against anaerobic organisms and helps control protozoal diarrhea (Kimura et al., 2007).
●For acute bacterial diarrheal illnesses, particularly those with suspected enteric bacterial pathogens, ciprofloxacin is commonly prescribed at doses of 200–500 mg twice daily for duration of 5 to 7 days. Its broad-spectrum activity is beneficial in treating various enteric infections (Pichler et al., 1986). While traditional use and preliminary studies support the anti-diarrheal efficacy of these plants, standardized preparations with defined phytochemical content are essential for consistent therapeutic outcomes. Quality control measures, including standardization of active compounds, contamination screening, and batch-to-batch consistency are crucial for clinical applications. The traditional anti-diarrheal plants demonstrate good safety profiles when used appropriately. However, potential considerations include:
●Drug interactions: Tannin-rich plants may interfere with absorption of certain

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medications
●Contraindications: Some plants may not be suitable during pregnancy or in specific medical conditions
●Dosage considerations: Appropriate dosing is essential to avoid potential adverse effects
●After use side effects if a medicine after extraction and is still active and cause harms on environments for example like in England fish antidepression medicine inhibits their antiprey habits of eels (Sures et al., 2025).

Bile Acid Binding Resins

In certain patients, particularly those who have undergone intestinal surgery, diarrhea may occur due to the presence of unabsorbed bile acids reaching the colon. This situation can lead to irritation of the intestinal lining and increased motility, resulting in frequent and loose stools.

Bile acid binding resins, such as cholestyramine and colestipol, are effective agents used to manage this type of diarrhea. These resins work by binding excess bile acids in the gastrointestinal tract, preventing their absorption and subsequent irritation of the colon.

By binding to bile acids, these agents form insoluble complexes that are excreted in the stool. This process reduces the concentration of bile acids in the colon, thereby alleviating irritation and decreasing stool frequency.

The use of bile acid-binding resins can significantly improve symptoms in patients experiencing bile acid-induced diarrhea. By reducing the frequency of bowel movements and improving stool consistency, these agents enhance the quality of life for affected individuals (Barbara et al., 2025).

Overall, bile acid binding resins represent an important therapeutic option for managing diarrhea related to unabsorbed bile acids, particularly in patients with a history of intestinal surgery or other conditions that affect bile acid absorption.

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Octreotide

Octreotide is a somatostatin analogue with particular efficacy in managing hormone-mediated and secretory diarrhoeal disorders, including carcinoid syndrome, VIPomas, post-vagotomy diarrhoea, dumping syndrome, short bowel syndrome, and AIDS-associated diarrhoea (Marasco et al., 2024). The agent exhibits a favorable tolerability profile, though adverse effects may include nausea and abdominal discomfort. Prolonged administration carries the risk of cholelithiasis secondary to diminished gallbladder motility and subsequent bile stasis. (Bartels et al., 2011). Octreotide works by mimicking the effects of somatostatin, inhibiting the release of various hormones and reducing gastrointestinal motility (Wang, Le et al., 2025). This action helps to decrease the secretion of fluids and electrolytes in the intestines, thereby reducing diarrhea.

Overall, octreotide is a valuable therapeutic option for managing complex diarrheal disorders, particularly those that are hormone-mediated, providing relief and improving the quality of life for affected patients

Diphenoxylate

Diphenoxylate is a synthetic opioid commonly prescribed for the management of diarrhea. Its therapeutic effect arises from its action on intestinal opioid receptors, where it reduces peristalsis and prolongs gastrointestinal transit time, thereby allowing greater fluid absorption. To mitigate the potential for misuse,

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diphenoxylate is formulated in combination with atropine, marketed as co-phenotrope. Atropine, when taken in higher doses, produces unpleasant anticholinergic side effects, thus serving as a deterrent to abuse and reducing the risk of dependence or addiction associated with opioid derivatives. (Harford et al., 1980).

Loperamide

●In contrast, loperamide is another opioid derivative widely used as an antidiarrheal agent. Unlike diphenoxylate, loperamide has very limited systemic absorption and does not cross the blood–brain barrier effectively, making it much safer and virtually free from central opioid effects at therapeutic doses. Both drugs act through similar mechanisms on intestinal opioid receptors, but loperamide's superior safety profile and lower abuse potential make it the preferred first-line agent in most clinical settings. Loperamide is a well-tolerated option for the symptomatic treatment of non-infectious, self-limiting diarrhea. It provides relief by slowing intestinal transit, which helps to reduce the frequency and urgency of bowel movements (Li et al., 2007). Loperamide works by acting on the opioid receptors in the gut, leading to decreased peristalsis and increased transit time. This action allows for greater absorption of fluids and electrolytes, resulting in firmer stools. One of the key advantages of loperamide is its limited ability to penetrate the blood-brain barrier, which means it does not produce central opioid effects such as sedation or euphoria. This characteristic makes it a safer alternative for patients, as it minimizes the risk of opioid-related side effects (Yang et al., 2024). By effectively reducing gastrointestinal motility and fluid secretion, loperamide alleviates symptoms of diarrhea, allowing patients to manage their condition more comfortably. Overall, loperamide serves as a valuable therapeutic option for individuals experiencing non-infectious diarrhea, providing effective symptom relief while minimizing the risk of central nervous system side effects.

Adsorbents

Adsorbents are agents that provide mild symptomatic relief by physically binding toxins, microbial irritants, and excess fluid in the gastrointestinal tract (Geremew et al., 2024). They are primarily used as adjunctive therapy in the management of diarrhea and other gastrointestinal disturbances.

Common adsorbents include:

●Kaolin: A clay mineral that can absorb toxins and excess fluid, helping to firm up stools and reduce diarrhea.

●Pectin: A soluble fiber derived from fruits that can bind water and form a gel-like substance, which helps to bulk up stools and slow intestinal transit.

●Chalk (Calcium Carbonate): A calcium-based compound that can neutralize stomach acid and absorb excess fluid, providing relief from gastrointestinal discomfort.

●Ispaghula (Psyllium Husk): A natural fiber that absorbs water and forms a gel, aiding in stool formation and promoting regular bowel movements.

●Methylcellulose: A synthetic fiber that acts as a bulking agent, absorbing water in the intestines to help regulate bowel movements and alleviate diarrhea.

●Sterculia: A plant-derived fiber that can absorb water and toxins, helping to improve stool consistency and reduce diarrhea.

Overall, adsorbents play a supportive role in the management of gastrointestinal

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issues by binding harmful substances and excess fluid, thereby providing symptomatic relief and promoting digestive health.

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●Medicinal Plants with Anti-Diarrheal Properties

●The anti-diarrheal efficacy of medicinal plants is primarily attributed to bioactive compounds, including tannins, flavonoids, alkaloids, saponins, and essential oils. These phytochemicals exert therapeutic effects through multiple mechanisms, including antimicrobial activity, anti-inflammatory effects, astringent properties, and modulation of intestinal motility (El-Saadony et al, 2025). Saponins and related compounds help stabilize intestinal cell membranes, reducing permeability and fluid loss. Major Medicinal Plants with Anti-Diarrheal Properties

●Careya arborea Roxb.

Its therapeutic efficacy is attributed to a diverse phytochemical profile, including flavonoids, tannins, saponins, and triterpenoids. In addition to diarrhea, the plant is also employed in managing conditions such as bronchitis, jaundice, skin diseases, asthma, ulcers, wounds, filarial infections, boils, fever, cancer, and various inflammatory and infectious diseases. Reported pharmacological activities include anthelmintic, demulcent, tonic, antidiarrheal, antioxidant, hepatoprotective, analgesic, and antileishmanial effects (Prakash et al., 2012).

The therapeutic efficacy of C. arborea is primarily attributed to its rich phytochemical diversity, encompassing multiple classes of bioactive compounds (Kashyap et al., 2021). Principal constituents include flavonoids, tannins, saponins and tripertenoids. C. arborea has been extensively utilized in traditional medicine systems for treating a broad spectrum of conditions. In gastrointestinal disorders: are particularly effective in managing diarrhea and related gastrointestinal disturbances, attributed to the astringent properties of tannins and the membrane-stabilizing effects of saponins. Careya arborea Roxb represents a valuable medicinal plant with substantial therapeutic potential, supported by both traditional knowledge and emerging scientific evidence (Kaur et al., 2025). Its complex phytochemical profile underlies diverse pharmacological activities spanning antimicrobial, anti-inflammatory, hepatoprotective, and potentially anticancer properties. Continued research and clinical validation will be crucial for translating this traditional knowledge into evidence-based therapeutic interventions

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●Mentha longifolia

●Mentha longifolia, a member of the Lamiaceae family, has long been valued in traditional medicine, particularly for the treatment of diarrhea and dysentery using its dried leaves and young twigs. Its therapeutic potential is attributed to a rich phytochemical composition, including essential oils (such as pulegone, menthol, and menthone), flavonoids, phenolic acids, tannins, and terpenoids. These bioactive constituents underlie the plant's diverse pharmacological activities, which include carminative, stimulant, antipyretic, antinociceptive, cytotoxic, insecticidal, and antimicrobial effects. Notably, the essential oils contribute to antimicrobial and carminative properties, while flavonoids and phenolic compounds provide antioxidant and anti-inflammatory actions,

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supporting its traditional use in gastrointestinal disorders. (Mkaddem et al., 2009). Mentha longifolia demonstrates several beneficial activities, including: carminative, stimulant, antipyretic, antimicrobial, and cytotoxic. The diverse pharmacological properties of Mentha longifolia highlight its significance in traditional medicine, particularly for gastrointestinal health. Its multifaceted effects were studied in several studies (Hirata et al, 2025; Tourabi et al., 2025). Initial in vitro studies of Mentha longifolia demonstrated efficacy against Entamoeba histolytica and bacterial pathogens associated with diarrhea. A subsequent clinical trial in Pune involved five physicians administering a 150 mg tablet of the plant's bioactive fractions three times daily for up to 14 days. Patients showed symptomatic improvement by the second day, and all seven cases of amebic dysentery reported full recovery by the end of the treatment period, validating its clinical use in managing diarrhea and dysentery (Patwardhan et al., 1990).

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●Psidium guajava L. (Guava)

●Psidium guajava, commonly known as guava, is a tropical fruit renowned for its nutritional and medicinal properties. The leaves of the guava plant are particularly rich in bioactive compounds, including tannins (notably ellagitannins), flavonoids (e.g., quercetin and kaempferol), and essential oils. This review highlights the phytochemical profile of P. guajava and evaluates its therapeutic potential in managing gastrointestinal (GI) disorders, particularly diarrhea.

●Guava leaves contain high concentrations of tannins, flavonoids, and essential oils. Tannins, particularly ellagitannins, exhibit astringent properties that reduce intestinal secretions and inflammation, making them effective in managing GI issues. Flavonoids, such as quercetin and kaempferol, contribute to antioxidant and anti-inflammatory effects. Essential oils further enhance the plant's medicinal properties.

Guava leaf extracts exhibit potent antimicrobial activity against enteric pathogens, including Escherichia coli, Shigella, and Salmonella species, which are common causes of diarrheal diseases (Liu et al. 2025). Several clinical studies have demonstrated the significant anti-diarrheal efficacy of guava leaf extracts. Standardized leaf extracts have shown comparable efficacy to conventional antidiarrheal medications in clinical trials, underscoring their potential as a natural alternative for managing diarrhea.

The rich phytochemical profile of P. guajava and its demonstrated therapeutic effects make it a promising candidate for further research and application in GI health management. Further studies are warranted to optimize dosage, standardize extracts, and evaluate long-term safety and efficacy.

●Mangifera indica L. (Mango)

Mangifera indica (mango) is a tropical tree with medicinal properties, particularly in the treatment of gastrointestinal (GI) disorders like diarrhea and dysentery.

Mango bark and leaves are rich in bioactive compounds, including mangiferin, tannins, gallic acid, and polyphenolic compounds. Mangiferin is a major active constituent, while tannins contribute to astringent properties (Castro-Muñoz et al., 2024). Mangiferin exhibits anti-inflammatory and antimicrobial effects, while tannins provide astringent properties that normalize bowel movements

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and reduce fluid loss. Traditionally used across cultures for treating dysentery and chronic diarrhea, mango extracts have been validated in modern research for their antimicrobial activity against common enteric pathogens.

The phytochemical profile of Mangifera indica and its demonstrated therapeutic effects make it a promising candidate for further research and application in GI health management. Further studies are needed to optimize dosage, standardize extracts, and evaluate long-term safety and efficacy.

Punica granatum (Pomegranate)

Pomegranate (Punica granatum) is a fruit renowned for its medicinal properties, particularly in gastrointestinal (GI) health. This review highlights its phytochemical profile and therapeutic potential, focusing on its use in managing diarrhea and dysentery. Pomegranate peels are rich in bioactive compounds, including ellagitannins, punicalagins, and anthocyanins. These compounds contribute to its therapeutic effects. Pomegranate extracts exhibit potent antimicrobial activity against enteric pathogens and possess anti-inflammatory properties that reduce intestinal inflammation and normalize bowel function. Studies have demonstrated significant efficacy against antibiotic-resistant bacterial strains, making pomegranate particularly valuable in treating persistent diarrheal infections. The phytochemical profile of Punica granatum and its demonstrated therapeutic effects make it a promising candidate for further research and application in GI health management (Andishmand et al., 2025). Further studies are needed to optimize dosage, standardize extracts, and evaluate long-term safety and efficacy.

Syzygium cumini L. (Java Plum)

Syzygium cumini (Java plum) is a medicinal plant with traditional and modern applications in gastrointestinal (GI) health. Java plum bark and seeds are rich in bioactive compounds, including anthocyanins, tannins, flavonoids, and essential oils. These compounds contribute to its therapeutic effects. Java plum extracts exhibit strong astringent properties that reduce excessive fluid secretion and possess antimicrobial properties that combat causative pathogens (Adithya et al., 2025). The phytochemical profile of Syzygium cumini and its demonstrated therapeutic effects, especially after a long-term and safe approach in traditional medicine systems for treating dysentery and chronic diarrhea conditions, also in combinations with other methods (Wu et al. 2009)

Terminalia chebula Retz. (Black Myrobalan)

Terminalia chebula (black myrobalan) is a medicinal plant with a rich phytochemical profile and established therapeutic potential in gastrointestinal (GI) health. This review highlights its phytochemical composition and clinical applications, focusing on its use in managing diarrhea and dysentery. Black myrobalan contains hydrolysable tannins (e.g., chebulic acid, gallic acid), flavonoids, and triterpenoids, which contribute to its therapeutic effects. The plant exhibits broad-spectrum antimicrobial activity, anti-inflammatory effects, and astringent properties that help normalize intestinal function. Terminalia chebula has demonstrated efficacy in treating various diarrheal conditions proven by Liu et al, (2024).

Aegle marmelos L. (Bael)

Aegle marmelos, commonly known as bael, is recognized for its rich phytochemical profile, which includes marmelosin, tannins, flavonoids, and essential oils. Both the fruit and leaves of the bael plant possess notable

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therapeutic properties.
Phytochemical Profile: The presence of marmelosin, along with tannins and flavonoids, contributes to the plant's health benefits. Essential oils found in bael also play a significant role in its medicinal effects. : The tannins in bael provide astringent effects, which help reduce intestinal secretions and inflammation. Additionally, the essential oils exhibit antimicrobial activity against enteric pathogens, making bael effective in combating infections that can lead to gastrointestinal disturbances. Bael is considered one of the most effective traditional remedies for chronic diarrhea and dysentery in Ayurvedic medicine (Poojan et al., 2024). Its long-standing use in traditional practices underscores its importance as a natural treatment option for gastrointestinal ailments.
Overall, the combination of its phytochemical constituents and traditional significance positions Aegle marmelos as a valuable resource for managing digestive health and addressing conditions such as diarrhea and dysentery.

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Conclusion

This overview highlights how medicinal plants have long been used to treat gastrointestinal conditions, especially diarrhea, which is still a significant global public health concern. Many people still treat common illnesses with herbal medicines, particularly those based on Unani medicine, all throughout the world. However, further research is required to isolate and characterize the specific phytoconstituents responsible for these therapeutic effects, despite evidence that several plants possess significant antidiarrheal properties. Such efforts not only promote evidence-based validation but also facilitate the integration of traditional therapies into modern medical practice. Systematic study and documentation of traditional medicinal knowledge can provide valuable complementary approaches for global health care. Nonetheless, improvements in sanitation and hygiene remain essential preventive strategies for reducing the incidence of diarrheal diseases.

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Table 1: Medicinal plants having anti-diarrheal activity

Cynodon dactylon	Poaceae	Leaves and stems	Anti-diarrheal, anti-inflammatory, chemopreventive	Babu et al., 2009
Ziziphus mauritiana	Rhamnaceae	Roots	Anti-diarrheal	Dahiru et al., 2006
Calotropis gigantea	Apocynaceae	Roots, root bark and leaves	Anti-diarrheal	Havagiray et al., 2004
Punica granatum	Lythraceae	Seeds	Anti-diarrheal	Das et al., 1999
Asparagus racemosus	Asparagaceae	Roots	Anti-diarrheal	Venkatesan et al., 2005
Xylocarpus moluccensis	Meliaceae	Bark, fruit	Anti-diarrheal	Uddin et al., 2005
Xylocarpus granatum	Meliaceae	Bark	Anti-diarrheal	Rouf et al., 2007
Psidium guajava	Myrtaceae	Leaf	Anti-diarrheal	Lutterodt, 1992
Rhizophora mucronata	Rhizophoraceae	Bark	Anti-diarrheal	Rohini et al., 2010
Ixora coccinea Linn	Rubiaceae	Flowers	Anti-diarrheal	Maniyar et al., 2010
Diospyros peregrine	Ebenaceae	Bark	Anti-diarrheal	Rouf et al., 2006
Moringa oleifera	Moringaceae	Leaf	Anti-diarrheal	Lakhsminarayana et al., 2011
Elettaria cardamomum	Zingiberaceae	Fruit	Anti-diarrheal	Rahman et al., 2008
Mimosa pudica	Fabaceae	Root, leaves	Antidiarrheal, antidepressant, hypolipidemic	Balakrishnan et al., 2006
Anthocephalus cadamba	Rubiaceae	Flowering tops	Anti-diarrheal	Alam et al., 2008
Ocimum gratissimum	Lamiaceae	Leaves	Antidiarrheal	Veronica et al., 1999
Alchornea cordifolia	Euphorbiaceae	Leaves	Anti-diarrheal	Agbor et al., 2004
Nymphaea alba	Nymphaeaceae	Roots, flowers	Antidiarrheal, anxiolytic, anticancer	Bose et al., 2012
Nelumbo nucifera	Nelumbonaceae	Rhizome	Antidiarrheal	Mukherjee et al., 1995
Paederia foetida Linn	Rubiaceae	Roots, leaves	Antidiarrheal, anti-inflammatory	Afroz et al., 2006
Mangifera indica	Anacardiaceae	Seed	Antidiarrheal, immunomodulant, hypoglycemic,	Sairam et al., 2003

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Mezoneuron benthamianum Baill	Caesalpiniaceae	Leaves	Antidiarrheal, antipyretic, analgesic	Anti-inflammatory, Mbagwu et al., 2008
Piper nigrum L.	Piperaceae	Fruit	Antidiarrheal	Shamkuwar et al., 2012
Mimosa pudica	Fabaceae	Leaves	Antidiarrheal	Saifiddin et al., 2011
Cyperus rotundus	Cyperaceae	Roots	Antidiarrheal	Uddin et al., 2006