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DIETARY MODIFICATION AND GUT MICROBIOTA IN PROCTOLOGY: A SYSTEMATIC REVIEW

Dr. Mamta Upadhyay*[1], Dr. B. Swapna[2], Dr. Noopur Singh[3]

[1,3]PG Scholar, Department of Shalya Tantra, National Institute of Ayurveda (NIA), a deemed-to-be University, Jaipur, Rajasthan, India.

[2]Professor, Department of Shalya Tantra, National Institute of Ayurveda (NIA), a deemed-to-be University, Jaipur, Rajasthan, India.

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***Corresponding Author**

Dr. Mamta Upadhyay

PG Scholar, Department of Shalya Tantra, National Institute of Ayurveda (NIA), a deemed-to-be university, Jaipur, Rajasthan, India.

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ABSTRACT

Background: The pathophysiology and clinical treatment of anorectal diseases are significantly influenced by dietary variables and the gut flora. Bowel habits, stool consistency, persistent straining, intestinal inflammation, and mucosal barrier integrity are pathophysiologically linked to common illnesses such as hemorrhoids, anal fissures, chronic constipation, fistula-in-ano, and inflammatory anorectal diseases. Targeted nutritional therapies and precise control of the gut microbiota can reduce acute symptoms, speed up mucosal healing, and reduce recurrence rates in proctologic illnesses, according to growing clinical evidence. **Objective:** The clinical role of dietary changes and the composition of the gut microbiota in the management, prevention, and long-term therapeutic results of prevalent proctologic disorders is summarized in this narrative systematic review. Concepts Major medical repositories, such as PubMed, Scopus, Google Scholar, and international clinical guideline databases, were queried to conduct a narrative systematic review. Randomized controlled trials (RCTs), systematic reviews, meta-analyses, and high-throughput microbiome sequencing investigations were the main types of peer-reviewed clinical research that were assessed. Clinical information about dietary fiber supplements, hydration practices, prebiotics, probiotics, synbiotics, and the structural dysbiosis of the gut microbiota in anorectal disorders was selectively isolated by search vectors. **Results:** The

clinical evidence clearly shows that dietary fiber supplementation considerably reduces the symptoms of acute anal fissures, chronic idiopathic constipation, and hemorrhoids. By decreasing chronic straining during defecation, conservative dietary measures successfully lower intra-abdominal and intravascular pressures, resulting in lower rates of recurrence following treatment. Concurrently, intestinal dysbiosis is a major cause of both local mucosal inflammation and persistent functional constipation, according to high-throughput sequencing studies. Probiotics and synbiotics are examples of microbiota-targeted treatments that have shown great promise in reducing tissue inflammation, increasing bowel frequency, and improving stool consistency. However, the present clinical evidence is marked by considerable strain and dosage heterogeneity. **Summarization:** The aetiology and therapeutic management of anorectal diseases are significantly influenced by dietary variables and gut flora. Common issues include hemorrhoids, anal fissures, chronic constipation, fistula-in-ano, and inflammatory anorectal disorders, which are pathophysiologically associated with intestinal inflammation, bowel habits, stool consistency, prolonged straining, and mucosal barrier integrity. There is increasing clinical evidence that targeted nutritional therapy and careful regulation of the gut microbiota can minimize acute symptoms, accelerate mucosal healing, and lower recurrence rates in proctologic disorders. fundamental pillar of contemporary proctologic care, providing a low-cost, low-risk, and very successful primary treatment approach. Although gut microbiota research offers promising possibilities for customized therapy, large-scale, multi-center, double-blind RCTs are still needed before accurate microbiome-based procedures can be fully integrated into routine proctologic algorithms.

KEYWORDS: Proctology, diet, gut microbiota, constipation, hemorrhoids, anal fissures, probiotics, and fiber are some of the keywords.

Greetings Across all age groups, proctologic illnesses account for a significant share of gastroenterology and general surgery presentations worldwide and have a significant healthcare burden. The quality of life is greatly diminished by conditions like hemorrhoids, anal fissures, chronic constipation, fistula-in-ano, and functional anorectal diseases, which often result in chronic discomfort, rectal bleeding, psychological distress, and missed work. Daily mechanical and biological elements, such as tissue inflammation, mucosal wall strength, internal and external anal sphincter tone, and local vascular pressure, are closely linked to the physiological mechanisms causing these disorders. For many years, food and

conservatism have been the first lines of defense against benign anorectal diseases. Physicians frequently advise boosting water, increasing dietary fiber, and creating healthful bowel habits to soften stool and limit the chronic straining that strains pelvic floor anatomy.[1] But it would be oversimplified to treat these disorders as solely mechanical problems brought on by hard stool. Our in-depth understanding of the human gut microbiome—the intricate ecosystem of billions of microorganisms living in our gastrointestinal tract—is driving a significant change in modern gastroenterology. Intestinal motility, immune system regulation, and local tissue health are all dependent on this tiny community.[2]

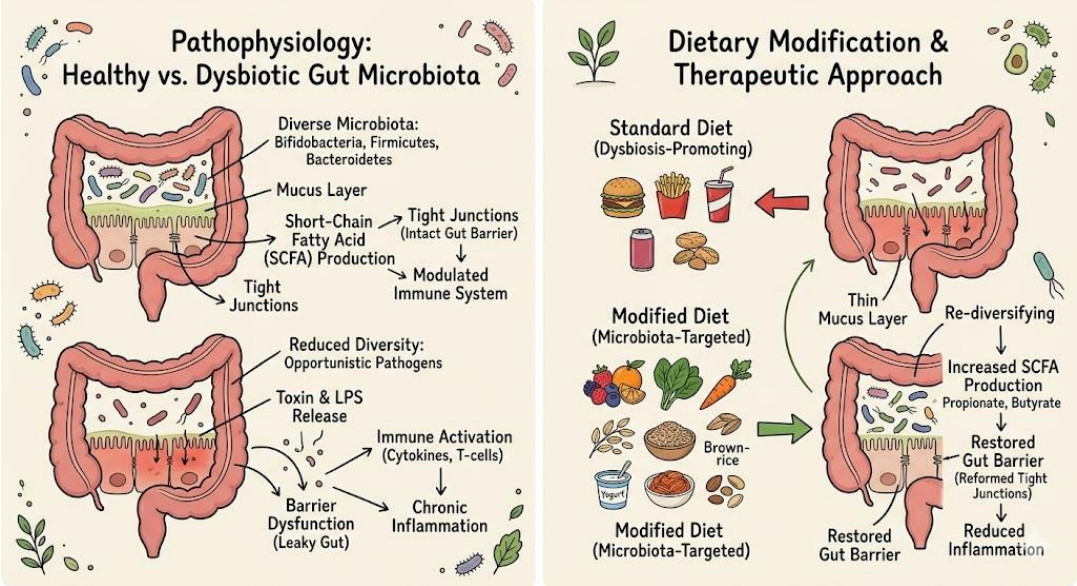
Recent metabolomic and high-throughput sequencing investigations have demonstrated that changes in this ecosystem, referred to as dysbiosis, can set off a series of problems. Dysbiosis causes low-grade, chronic tissue inflammation, impairs colonic transit, and weakens the rectum's protective mucus barrier.

[3]INTESTINAL DYSBIOSIS (altered microbial diversity, decreased beneficial taxa) & METABOLIC & MOTILITY DISRUPTION
Decreased short-chain fatty acids (SCFAs)
Altered local serotonin (5-HT) and bile acid pathways

MECHANICAL & MUCOSAL DYSFUNCTION- Delayed colonic transit time & hard, dry stools- Mucosal barrier degradation and baseline inflammation.

PROCTOLOGIC PATHOLOGY

Straining -> Hemorrhoidal cushion prolapse
Hard stool passage -> Mechanical anoderm tearing



We are learning that the microbiome affects everything from hemorrhoidal cushion flexibility to the rate at which an anal fissure heals as we map out the gut-proctology axis.[3] This systematic review examines the existing research on the relationship between proctology, gut microbiota, and nutrition. Our goal is to present a current, clinically applicable overview of non-surgical care for anorectal illnesses by integrating traditional nutritional modifications with state-of-the-art microbiome research. How to A systematic search method was developed to gather both basic research and recent clinical findings in order to create a thorough, current picture of this developing topic.

Databases and Search Methodology

- We searched PubMed, Scopus, Google Scholar, and the Cochrane Central Register of Controlled Trials (CENTRAL) for relevant literature. Additionally, we looked through databases on changing clinical standards to significant international organizations, such as the American Gastroenterological Association (AGA), the European Society of Coloproctology (ESCP), and the American Society of Colon and Rectal Surgeons (ASCRS).
- Medical Subject Headings (MeSH) terms and free-text keywords were combined to create the search strings:
- "Dietary modification" AND "proctology" AND "fiber" AND "hemorrhoids" AND "bleeding" AND "gut microbiota" AND "anorectal disease" AND "dysbiosis" AND "probiotics" or "synbiotics" AND "chronic constipation" AND "anal fissure" AND "conservative management" AND "diet" AND "microbiome" AND "fistula-in-ano" AND "pathogenesis"

- Criteria for Inclusion and Exclusion
- Strict criteria were used to screen the articles:
- Criteria for Inclusion: High-resolution microbial sequencing datasets, prospective cohort studies, systematic reviews, meta-analyses, and controlled clinical trials all concentrated on adult human populations (18 years of age or older) exhibiting benign proctologic diseases. Research assessing dietary habits, particular fiber supplements, prebiotics, Syntheses and Data Extraction Relevant papers were retrieved for full-text evaluation after two investigators independently assessed the titles and abstracts. Sample size, intervention details (fiber type, probiotic strain, dosage, duration), primary clinical metrics (pain reduction, bleeding resolution, stool consistency, bowel frequency), and, if relevant, microbiome alterations were noted when the data were grouped by particular proctologic disorders. The results are given in a narrative synthesis alongside published clinical data because a meta-analysis of the sequencing data was not feasible due to the varied nature of the microbiome datasets.

Dietary Changes' Significance in Proctology

1. Hemorrhoidal illness

One of the most prevalent conditions affecting contemporary civilizations is hemorrhoidal illness, which is typified by the inflammation and displacement of the fibrovascular cushions lining the anal canal. Although its roots are elevated intra-abdominal pressure and local venous congestion, which are often brought on by extended toilet sitting, hard, irregular bowel movements, and persistent straining during defecation are the main causes of this complicated and multifactorial illness.[3]

The primary line of treatment for hemorrhoidal illness is dietary fiber. Fiber uses both chemical and mechanical processes to function mechanistically

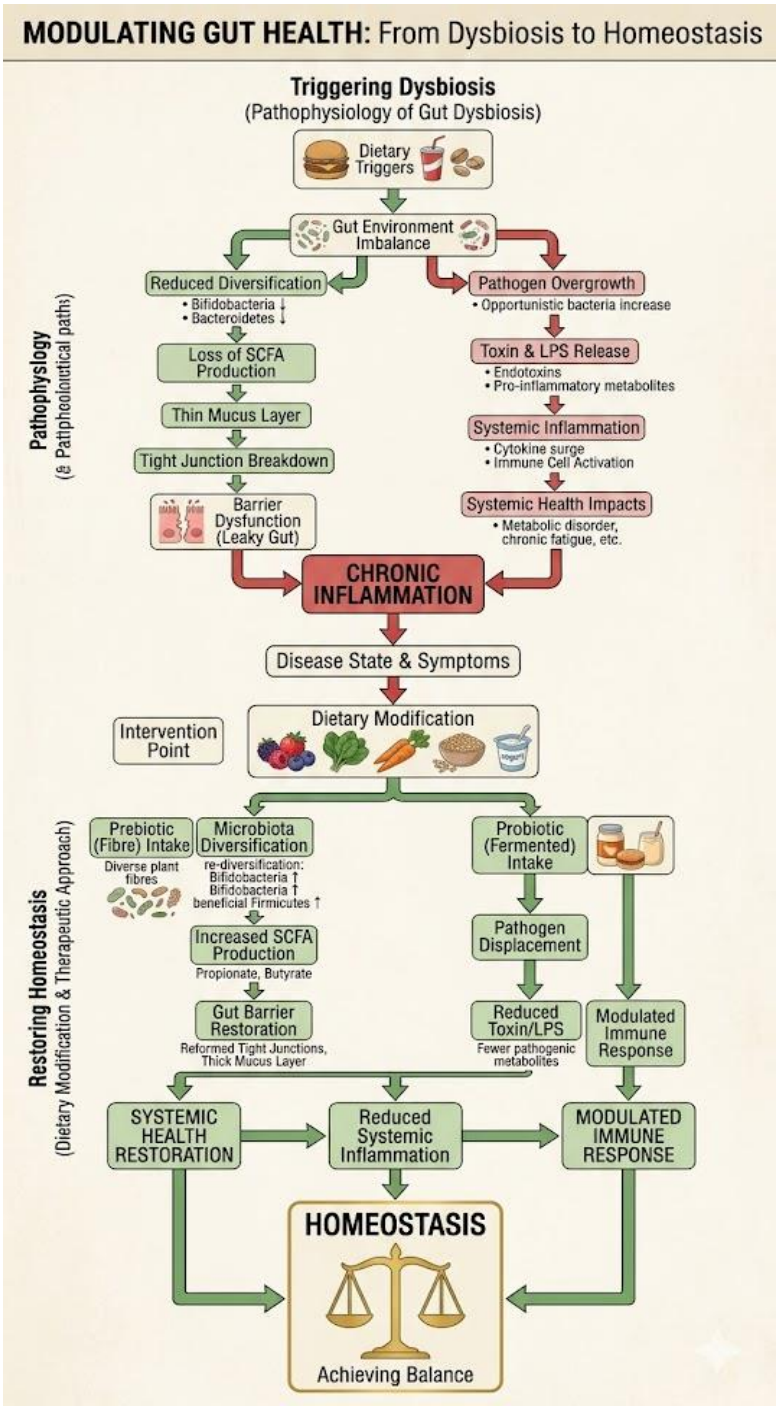
- 1. Dietary fiber intake, including soluble and insoluble fiber.

- 2. The mucosa experiences mechanical irritation. It turns into a slick, thick gel. Water is bound in the stool core, preventing severe desiccation. Reduced intra-anal pressures, reduced defecatory shearing forces, and decreased venous congestion within hemorrhoidal cushions lubricate the structural passage and increase transit speed.

- Alonso-Coello et al.'s innovative systematic review and meta-analysis, which showed that regular fiber supplementation decreased bleeding by 50%, offered compelling data in

support of this strategy.[4] Particularly in patients with early-stage (Grade I and II) haemorrhoids, targeted fiber therapy often reduces the need for surgical or office-based procedures. Current medical guidelines advise a structured dietary strategy to maximise these therapeutic benefits: Fiber Objectives of Interest: a goal of 20 to 35 grams of total dietary fiber that is evenly distributed between soluble and insoluble types[2] Drinking at least 1.5 to 2 liters of water every day is known as hydration syncing. Increased insoluble fiber can exacerbate constipation and produce stool clumping if one is not well hydrated. Sitting on the toilet and avoiding prolonged straining are two defecation behaviours. To avoid chronic pelvic floor congestion, keep the duration under five minutes. Reducing consumption of highly processed, low-fiber meals that impede colonic transit is known as "processed food reduction."Dietary Fiber Source, Type of Fiber Mostly Present, Clinical Action Mechanism in Proctology: Whole Grains (Barley, Oats) Mixed (beta-glucans with high solubility): production of viscous reduction of moisture loss, and softening of stool.[5]

- Legumes, such as chickpeas and lentils, high in insoluble/fermentable fiber, promote the formation of short-chain fatty acids in the colon and increase the volume of feces.[2]



Dietary Fiber Source	Fiber Type Primarily Present	Mechanism of Clinical Action in Proctology
Whole Grains (Oats, Barley)	Mixed (High Soluble beta-glucans)	Viscous gel formation, slowing moisture loss, stool softening.[5]
Legumes (Lentils, Chickpeas)	High Insoluble / Fermentable	Increases fecal bulk, fuels colonic short-chain fatty acid production.[2]
Psyllium Husk (Supplemental)	Highly Soluble / Viscoelastic Gel	High water retention, lubricates the anal canal, limits tissue shearing[1]
Cruciferous Vegetables	High Insoluble Cellulose	Provides structural bulk, mechanically stimulates mucosal propulsion.[6]

2. Anal Crevices

Painful linear ulcers in the anoderm, anal fissures typically extend distally from the dentate line to the anal margin. When a big, hard stool passes through the lining, it usually causes a mechanical injury that results in a painful spasm of the internal anal sphincter [7] A cycle of prolonged ischemia (poor blood supply) and unsuccessful wound healing is created by this spasm's compression of local blood arteries, which lowers blood flow to the posterior midline.[8] The goal of medical treatment for acute anal fissures is to interrupt this cycle of pain and spasm. The first-line treatment, according to the American Society of Colon and Rectal Surgeons (ASCRS) guidelines, is fibre supplements along with warm sitz baths.[9] Maintaining consistently soft stools is crucial to avoiding recurrent surgical sphincterotomies.

3. Idiopathic Constipation, Chronic (CIC)

Chronic constipation is a key underlying cause of several proctologic illnesses, making it more than just an isolated discomfort. The pelvic floor's structural support network is continuously stressed by dry, hard stools and persistent straining.[7] According to the guidelines of the American College of Gastroenterology (ACG) and the American Gastroenterological Association (AGA), dietary fibre should always be the first line of treatment for chronic idiopathic constipation.[10] Psyllium husk is the supplemental fibre with the best supporting data. Psyllium forms a smooth, thick gel that retains its water content throughout the whole length of the colon, in contrast to insoluble fibre, which can cause gas and bloating if added too soon [1] Stool remains soft and wet as a result. even in patients with delayed colonic transit.

4. Functional and Inflammatory Anorectal Disorders

Careful, customised nutritional therapy is necessary for anorectal signs of Inflammatory Bowel Disease (IBD), such as severe proctitis or perianal Crohn's disease. Certain dietary patterns can help lower overall mucosal inflammation and calm hyperactive bowel movements, diet alone cannot treat profound inflammatory ulcerations.[2] In order to treat overlapping functional bowel symptoms, such as gas, bloating, and rectal urgency, diets low in Fermentable Oligosaccharides, Disaccharides, Monosaccharides, and Polyols (low-FODMAP) are commonly employed. However, these approaches should be continuously supervised by a specialist gastrointestinal dietician because extremely restrictive diets may unintentionally deplete good gut bacteria over time.

The Anorectal Axis and Gut Microbiota

1. The Dynamics of the Intestinal Ecosystem

The incredibly intricate metabolic ecology known as the human gut microbiota is made up of trillions of bacteria, viruses, fungi, and archaea. It acts almost as an independent organ system, performing vital biological tasks that our bodies are unable to perform on their own. Important roles include converting complex dietary carbohydrates into bioactive metabolites, maintaining the structural integrity of the epithelial barrier, training the mucosal immune system, and producing essential vitamins.[2] SCFA, or short-chain fatty acid, Production of butyrate, propionate, and acetate; epithelial energetics; immune modulation; butyrate powers colonocytes. Inhibits cytokines that promote inflammation. Enhances tight junctions. Enhances mucosal tissue repair, differentiation, and tissue healing by promoting regulatory T-cells (Treg). There is a discernible decrease in beneficial, anti-inflammatory bacteria when this balance is disturbed, a condition known as dysbiosis. increase in opportunistic pathogens, and a drop in overall microbial diversity.[3] This shift leads to real changes in the local tissue environment, impacting bowel motility, how we process pain, and the health of the anorectal mucosa.

2. Functional Constipation and Structural Dysbiosis

The notion that persistent functional constipation is solely a mechanical problem is being challenged by new research that demonstrates a strong connection between the condition and structural alterations in the gut microbiota. Patients with chronic constipation have distinct microbial variations from healthy people, according to high-throughput sequencing.[11]

Key Commensal Depletion: A noticeable decline in specialized anaerobic fermenters, especially species of Lactobacillus and Bifidobacterium.

Methanogen Enrichment: A notable rise of hydrogen-consuming methanogenic archaea, mainly Methanobrevibacter smithii.

Metabolic changes include an increase in pathways that break down protective mucus and a decrease in genes that produce short-chain fatty acids (SCFAs).

Through a number of routes, these microbial alterations modify intestinal transit. As a direct local neuromuscular inhibitor, methane gas slows down peristalsis in the colon. In addition, a deficiency in short-chain fatty acids hinders smooth muscle contraction, interferes with

appropriate water absorption, and lowers the energy supply to colon cells [7]. The hard, dry stools that occur from this transit delay offer the colon more time to extract water from the stool, which damages the anal canal mechanically.

3. Therapeutic Interventions Using Probiotics and Synbiotics

Clinicians are increasingly investigating targeted probiotics—live microorganisms that provide health advantages when taken in proper amounts—and synbiotics, which mix these beneficial bacteria with supportive prebiotic fibres, because dysbiosis clearly contributes to slowing down bowel movement. Certain probiotic formulations considerably increase the frequency of bowel movements and soften the consistency of the stool in individuals with functional.[12] constipation. By producing lactic and acetic acids, which naturally cause intestinal spasms, probiotics lower the local pH and aid in the restoration of equilibrium.[7] Additionally, they interact with the gut wall's enterochromaffin cells, causing serotonin (5-HT) to be released, which aids in accelerating intestinal transit. Although these findings are promising, variations in the particular bacterial strains employed, daily dosages, and individual gut profiles among study groups can still lead to a wide range of clinical outcomes.

4. Examining Anal Fistulas and Haemorrhoids' Microbiome

Furthermore, we are beginning to look into how the microbiome affects some anatomical disorders like haemorrhoids and difficult anal fistulas. The microbial communities on the tissue surface of excised haemorrhoids, for example, varied significantly. Infection with cryptocurrency Opportunistic pathogen entry into the anal glands - Microbiological translocation and biomass - growth of mixed cutaneous and intestinal flora The development of robust polymicrobial biofilms - CHRONIC FISTULOUS PERSISTENCE Enzymes that cause tissue damage are released continuously.

A persistent inflammatory feedback loop hinders the healing process.

Similar to this, new study indicates that complex biofilms and microbial translocation from the gut lumen into the surrounding tissue tracts frequently support a primary cryptoglandular infection in fistula-in-ano.[14] These diverse bacterial communities cause a long-lasting inflammatory reaction that destroys local tissue and hinders natural wound healing. While we are still working to prove direct cause-and-effect, mapping out these unique microbial profiles opens up interesting future possibilities for treatment—such as using targeted topical or systemic therapies alongside traditional surgical repair to improve healing.[8]

Clinical Implications and Practical Guidelines

Using dietary modifications and microbiome-targeted strategies in everyday proctology provides a safe, accessible, and cost-effective way to improve patient care. These conservative approaches are easy to combine with standard medical therapies, helping to ease symptoms early on and protect against long-term complications.

PATIENT PRESENTATION
(Symptomatic Haemorrhoids, Fissures, or CIC)
| **STEP 1: INITIAL DIETARY BASELINE**
Fibre: 20-35 g/day (incremental)
Hydration: 1.5-2.0 L fluid/day
Habit: <5 min toilet sitting time
|
Evaluate after 2-4 weeks
|
(Adequate Resolution) (Incomplete Resolution
MAINTENANCE PHASE STEP 2: MICROBIAL OPTIMIZATION|
Continue high-fibre intake. Add Psyllium supplementation| Monitor long-term compliance -
Introduce clinical-grade Periodic follow-up visits, multi-strain probiotics
|
Evaluate after 4 weeks
|
(Resolved) - (Refractory)- MAINTENANCE ADVANCED GASTRO
STRATEGY SURGICAL CARE

The following methodology provides a workable road map for treating adult patients who present with benign proctologic illnesses to direct clinical implementation: First, determine the dietary baseline. Gradual Fibre Titration: Tell the patient to increase their daily intake of dietary fibre over the course of two to three weeks until they reach a target of twenty-five to thirty grams. Bloating, gas, and brief stomach discomfort are common side effects that can be reduced by progressively increasing fibre.

Hydration Coaching: Make sure the patient consumes at least 1.5 to 2.0 litres of total liquids (mostly water) each day in addition to their fibre diet; increase this amount for physical

activity or warm weather. Behavioural Adjustments: Teach appropriate bowel habits, such as using a footstool to maximize the anorectal angle for easier removal, avoiding aggressive straining, and going when the need strikes.

Stage 2: Describe Target Supplemental Fibre

Psyllium Supplementation: Add psyllium husk (beginning at 3.5 to 7.0 grams once daily with a full glass of water) if dietary changes are not sufficient to soften stool. Depending on the patient's response in terms of bowel frequency and stool consistency, modify the dosage.[1]

Step 3: Include Support for the Microbiome

- Clinical-Level Probiotics: A multi-strain probiotic combining well-researched Bifidobacterium and Lactobacillus species should be added for a minimum of four weeks to individuals who continue to have slow motility or persistent straining.[12]
- Watch and Reassess: Examine the patient's development after four weeks. Maintain these dietary and lifestyle choices as a long-term maintenance plan to keep the illness from coming back once symptoms have subsided.
- Limitations of the Evidence at This Time
- While there is a link between

CONCLUSION

Modern proctologic care still heavily relies on dietary modification. Haemorrhoids, anal fissures, and chronic constipation can be effectively and economically treated by increasing dietary fiber, drinking enough water each day, and developing healthy bowel habits. Simultaneously, the emerging field of gut microbiome research is deepening our understanding of anorectal illnesses by demonstrating that local tissue inflammation and microecology, rather than merely mechanical factors, play a role in these conditions. Treating intestinal dysbiosis with targeted probiotics and synbiotics opens up exciting new possibilities for patient care. However, large-scale, well-designed clinical studies are still required to standardise particular bacterial strains and treatment regimens for normal proctologic practice before we can transition from broad recommendations to truly individualized, microbiome-based treatments.

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