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SUGAR-FREE, BUT NOT SYMPTOM-FREE: THE IMPACT OF ARTIFICIAL AND POLYOL-BASED SWEETENERS ON IBS AND GASTROINTESTINAL HEALTH

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ABSTRACT

Introduction and Objective: Irritable Bowel Syndrome (IBS) is a common gastrointestinal disorder significantly influenced by diet. In recent years, sugar-free products containing artificial sweeteners and polyols have become increasingly popular, especially among people with IBS. This article reviews the impact of these sweeteners on IBS symptoms and gut microbiota.
Methods: This is a literature review based on articles from the PubMed database published between 2020 and 2025. Studies focusing on artificial sweeteners, polyols, and their effects on IBS and gut health were included.
Results: The reviewed studies show that some artificial sweeteners and polyols can worsen IBS symptoms such as bloating, gas, and diarrhea. Additionally, they may negatively affect the gut microbiota, contributing to dysbiosis.
Conclusion: Although promoted as healthier sugar substitutes, many sweeteners may be problematic for IBS patients. Their consumption should be individualized and approached with caution.

KEYWORDS

IBS, Artificial Sweeteners, Polyols, Gut Microbiota, Dysbiosis, FODMAP, Gastrointestinal Symptoms

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1. Introduction

Irritable Bowel Syndrome (IBS) is a chronic functional disorder characterized by abdominal discomfort, pain associated with defecation, and altered bowel habits, all of which can significantly impact a patient's quality of life.[1] IBS affects approximately 10–15% of the population in Western countries, while its prevalence appears to be lower in non-Western and developing regions.[2] The Rome IV criteria suggest that the pathogenesis of IBS is associated with disruptions in gut-brain interactions. In recent years, the widespread use of non-nutritive sweeteners (NNS) in”sugar-free" or”zero-calorie" products has raised concerns about their potential to exacerbate IBS symptoms. Emerging research indicates that some acellular nutrients, artificial sweeteners, and emulsifiers may negatively affect the gut microbiota.[3] This study aims to explore the relationship between sweeteners and IBS, with a particular focus on how dietary additives influence symptom severity and gut microbiota composition.

2. Research materials and methods

This review is based on an analysis of scientific literature sourced primarily from the PubMed database. Articles were selected through a structured search using keywords such as”irritable bowel syndrome”, ”gut microbiota”, ”non-nutritive sweeteners”, ”FODMAP”, and”artificial sweeteners”. The search focused on peer-reviewed studies published between 2020 and 2025, with a few earlier publications included for context when particularly relevant. Priority was given to original research articles, systematic reviews, and meta-analyses written in English.

3. State of knowledge

Recent research increasingly highlights the role of diet in the pathogenesis and management of irritable bowel syndrome (IBS), with particular emphasis on the gut microbiota. Non-nutritive sweeteners (NNS) and polyols, commonly present in sugar-free products and marketed as healthier alternatives, are now recognized as potential triggers of IBS symptoms. Although growing evidence links these substances to microbial alterations[4] and gastrointestinal disturbances, their exact mechanisms of action and long-term effects in the context of IBS remain insufficiently understood.

3.1 Pathophysiology of Irritable Bowel Syndrome (IBS)

IBS is a physical and mental illness with increasing global prevalence, particularly among women. Its etiology is multifactorial. As research has progressed and the Rome criteria have been updated, the understanding of IBS has evolved from a purely functional disorder to one involving complex brain-gut interactions.[5] Clinical studies suggest that alterations in the microbiome, gastrointestinal endocrine function, visceral hypersensitivity, and motility disorders are central contributors to symptoms such as abdominal discomfort, pain, and diarrhea. Dietary components play an active role in these mechanisms, as they can trigger gut responses via neural and hormonal pathways within the gut-brain axis. These interactions may lead to increased mucosal sensitivity, altered microbial metabolism, disrupted hormone and enzyme secretion, immune activation, and changes to the intestinal epithelium.[6] Given the intricate relationships between diet, microbiota, and neurogastroenterology, it is essential to investigate how specific components—like sweeteners—affect IBS pathophysiology.

3.2 Artificial Sweeteners and Gut Microbiota

In recent years, global concerns about obesity and cardiovascular disease have led to increased use of low- and non-caloric artificial sweeteners (NAS) as alternatives to sugar.[7] [8] Six NAS—namely aspartame, acesulfame-K, saccharin, sucralose, neotame, and advantame—have been approved by the U.S. Food and Drug Administration (FDA) for use under specified conditions. [9] However, scientific evidence increasingly suggests that NAS may negatively impact gut microbiota, a diverse community of microorganisms inhabiting the gastrointestinal tract.[10] Studies have shown that artificial sweeteners can contribute to microbial dysbiosis.[11] NNS can be metabolized by gut bacteria, leading to changes in short-chain fatty acid (SCFA) production—such as acetate, propionate, and butyrate—which influence glucose metabolism and inflammation.[12] While SCFAs can have beneficial effects, NNS may also reduce populations of beneficial bacteria like *Bifidobacterium* and *Lactobacillus*[13] and promote growth of pathogenic species such as *Clostridium difficile* and *E. coli*.[14], [15] These changes can disrupt gut motility, affect hormone secretion, and impair nutrient absorption, thereby contributing to metabolic dysfunction and gastrointestinal symptoms.[16]

3.3 Artificial Sweeteners and the Gut: Insights from Recent Literature

Basson et al. (2023)[17] examined artificial sweetener consumption among patients with Inflammatory Bowel Disease (IBD) and IBS. While overall usage rates were similar between IBD patients and healthy controls, the frequency of consumption was higher among those with IBD. Notably, all participants who reported consuming sweeteners”very often" were from the IBD group. These individuals also preferred sweetened drinks over water and consumed more artificially sweetened products overall. The authors hypothesize that these preferences may stem from gut dysbiosis, medical advice, social learning, or comorbidities such as obesity. Although perceived as a healthier alternative, sweeteners may contribute to long-term gut disturbances and thus require closer investigation. These findings underscore a paradox: while individuals with gut disorders may seek to avoid sugar, the sweeteners they consume instead may worsen their symptoms through microbiota disruption. More targeted research is needed to determine how specific sweeteners influence IBS symptomatology.

3.4 Sweeteners and Their Effect on IBS Symptoms

IBS presents with a range of gastrointestinal symptoms, including abdominal pain, bloating, diarrhea, constipation, and a persistent sense of incomplete evacuation. Dietary factors are widely acknowledged as key contributors to symptom onset and severity. Among these, sweeteners—especially non-nutritive ones—may exacerbate IBS symptoms. NNS can be metabolized by certain gut microbes, leading to dysbiosis, which is frequently observed in IBS patients.[18] Dysbiosis may increase visceral hypersensitivity, a known driver of pain and discomfort in IBS.[16]

Additionally, many polyols (e.g., sorbitol, mannitol, xylitol, and maltitol) are poorly absorbed in the small intestine. Upon reaching the colon, they undergo rapid bacterial fermentation, resulting in gas production and water influx. This can trigger hallmark IBS symptoms such as:

- **Bloating and flatulence** – due to fermentation-induced gas accumulation,
- **Abdominal cramping and pain** – from intestinal distension,
- **Diarrhea** – as a result of osmotic water retention [19],
- **Urgency and increased bowel movements. [18]**

These findings highlight the importance of personalized dietary approaches in managing IBS, especially regarding seemingly benign additives like sweeteners.

3.5 The Role of Diet in IBS: The Interplay Between FODMAPs and Sweeteners

FODMAPs—Fermentable Oligosaccharides, Disaccharides, Monosaccharides, and Polyols—are poorly absorbed carbohydrates that often provoke IBS symptoms through fermentation and water retention. [20] [22] Foods high in FODMAPs include certain fruits, vegetables, legumes, dairy products, and processed items. [21] [23]

Polyol-based sweeteners (e.g., sorbitol, mannitol, xylitol, maltitol) fall under the FODMAP category and are frequently found in sugar-free products. A recent randomized, double-blind, placebo-controlled crossover study revealed that while IBS patients absorb polyols better than healthy individuals, symptoms still occur, suggesting mechanisms beyond malabsorption—such as mucosal irritation or neurogastroenteric effects.[19], [24]

As patients seek sugar-free alternatives while adhering to low-FODMAP diets, they may inadvertently reintroduce symptom triggers through sweeteners. This underlines the importance of individualized dietary counseling and awareness of hidden ingredients in processed foods.

4. Discussion

This review highlights the complex relationship between sweeteners—particularly artificial non-nutritive sweeteners (NNS) and polyols—and IBS symptomatology. Although these substances are marketed as healthier alternatives, they may disrupt the gut microbiota and trigger typical IBS symptoms such as bloating, abdominal pain, and diarrhea.[9, 16, 17]

Notably, sugar alcohols such as sorbitol and mannitol, which are classified as FODMAPs, are commonly associated with symptom exacerbation, despite evidence of improved absorption in some IBS patients.[19] This suggests that additional mechanisms beyond fermentation may contribute to symptom development.[20, 21] Furthermore, sweeteners used in sugar-free products intended for low-FODMAP diets may inadvertently worsen symptoms if not carefully selected and monitored. [7, 17]

5. Conclusions

To refine dietary strategies for IBS management, future research should:

- Investigate the microbiota-specific effects of individual sweeteners [4, 9, 10],
- Analyze symptom responses based on IBS subtypes [1, 5],
- Conduct long-term clinical studies incorporating microbial and hormonal markers [3, 14],
- Examine interactions between sweeteners, dietary fibers, and probiotics [13, 22],
- Improve product labeling to enhance consumer awareness [8, 17].

Until more definitive guidelines are established, healthcare providers should exercise caution when advising on sweetener intake and personalize nutritional recommendations according to individual symptom patterns and tolerances [2, 6].

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