

REVIEW ARTICLE

How to institute the low-FODMAP diet

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Introduction

Fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAPs) have been investigated over decades for their poor absorption and resulting effects on the gastrointestinal tract. Increased luminal water content and fermentation by intestinal bacteria yield gas and fluid changes within the gut, contributing to the common symptoms of irritable bowel syndrome (IBS)—bloating, abdominal pain, excessive flatus, and altered bowel habit. The grouping of FODMAPs in 2005 and intensive food composition research has led to the development of the low-FODMAP diet, which is now becoming internationally recognized as a treatment strategy for IBS management. The diet is effective in a research setting and in specialized clinics around the world, but the clinical and dietary assessment of each patient, the dietician-driven education process, and the long-term management protocol is likely crucial for the consistent success of the diet.

The importance of diagnosis

Irritable bowel syndrome is the most common gastrointestinal disorder, affecting up to 15% of the Western population¹ and responsible for up to 50% of visits to gastroenterologists and at least five physician visits annually.² Common symptoms of IBS are bloating, abdominal pain, excessive flatus, constipation, diarrhea, or alternating bowel habit. These symptoms, however, are also common in the presentation of coeliac disease, inflammatory bowel disease, defecatory disorders, and colon cancer. Confirming the diagnosis is crucial so that appropriate therapy can be undertaken. Unfortunately, even in these alternate diagnoses, a change

Abstract

A diet low in poorly absorbed, fermentable, short chain carbohydrates (FODMAPs) is an effective strategy to manage symptoms of irritable bowel syndrome (IBS). The diet has gained traction since its original description in Australia 10 years ago and is now an internationally accepted dietary management strategy for IBS. Randomized controlled trials have raised the profile of the low-FODMAP diet to become a viable first-line therapy for IBS, when implemented under a dietitian's guidance. Importantly, the diagnosis of IBS should be confirmed before commencement of the dietary approach. The skill set of the dietitian is then paramount to the success of the diet. Experience in gastrointestinal disorder management, consideration of symptom types, severity, baseline FODMAP intake, and overall nutritional content and meal pattern are vital in the assessment of the patient. If a strict low-FODMAP diet is deemed necessary, it should only be for an initial period of 4 to 6 weeks. Research suggests that a strict long-term, low-FODMAP diet may negatively impact intestinal microbiome. After the initial strict period, follow up with the dietitian should be conducted to achieve the overall goal—a relaxed FODMAP restriction that enables inclusion of prebiotic FODMAPs while still maintaining symptom relief. The diet will be effective in the vast majority of patients. For those in which it fails, FODMAPs should be reintroduced to the diet, and other dietary (or non-dietary) approaches should be considered.

in diet restricting FODMAPs may improve symptoms and mask the fact that the correct diagnosis has not been made. This is the case with coeliac disease where a low-FODMAP diet can concurrently reduce dietary gluten, improving symptoms, and also affecting coeliac diagnostic indices.^{3,4} Misdiagnosis of intestinal diseases can lead to secondary problems such as nutritional deficiencies, cancer risk, or even mortality in the case of colon cancer.

Irritable bowel syndrome should be positively diagnosed, rather than being a diagnosis of exclusion, which it has historically become. The patients' symptom history and usual bowel habit provide the initial clinical data, which is suggestive of IBS, with diagnosis supported further by the absence of a family history of intestinal diseases, age risk for colon cancer, nocturnal defecation, and normal pathology including coeliac serology, iron studies, and serum folate and vitamin B12. Any "red flags" provided by these latter data should be followed up with gastroenterologist input, a gastroscopy and/or colonoscopy, and any other investigations as required. With diagnosis of IBS or an alternative functional gut disorder, patients should then be directed to a dietitian with expertise in gastrointestinal disorder management, including use of the low-FODMAP diet.

Dietary assessment to direct FODMAP restriction

The low-FODMAP diet is not a "one-size-fits-all" approach, nor is it a diet for life. There are different FODMAP subtypes based on carbohydrate chain length, to which each individual will react with a variation in symptom type and severity.

- The *oligosaccharides*, fructans and galacto-oligosaccharide (GOS), have the longest chain length and are found naturally in foods including wheat and rye products, legumes, nuts, artichokes, onion, and garlic. There is no human enzyme capable of breaking down fructans and GOS, and, as a result, they are malabsorbed in all of us.^{5,6} They are highly fermentable, and the resulting gas production when fructans and GOS meet colonic bacteria is likely a significant contributor to bloating, abdominal pain, and excessive flatus seen in IBS.⁷
- The *disaccharide* FODMAP is lactose, the sugar found in milk products that requires the enzyme lactase to break it down for absorption. Lactase activity can be reduced in certain ethnic backgrounds, such as Asian and Mediterranean, with increasing age, and during periods of intestinal inflammation such as in active Crohn's disease. Many individuals have adequate lactase production to digest their intake of dietary lactose and as such do not need to restrict lactose as part of a low-FODMAP diet. Breath hydrogen/methane testing, if available, can be used to assess lactose absorptive capacity, which can help to drive dietary advice.^{8,9}
- The *monosaccharide* FODMAP is fructose, a single sugar found in some fruits including apples, pears, watermelon, mango, as well as in honey and some vegetables including sugar snap peas. Fructose is also used as a commercial sweetener as fructose or high fructose corn syrup. Fructose is the smallest FODMAP carbohydrate, and it is this feature that leads to its high osmotic effect and ability to draw water into the bowel lumen. The resulting distension of the small intestine provides the stimulus for experiencing pain and bloating, and, if fructose is taken in very large amounts (like in association with a breath hydrogen test), it can contribute to diarrhea and altered motility. Initially, there was much focus on fructose malabsorption and its contribution to IBS symptoms, but recent research has identified that the amount of fructose malabsorbed is usually quite small and that fructose can lead to IBS symptoms independently of being malabsorbed. It is poorly absorbed across the length of the small intestine, and this slow, progressive absorption creates an osmotic effect whether it has been completely absorbed or not.⁷ As such, identification of the absorptive capacity for fructose is no longer important in the implementation of a low-FODMAP diet.
- The *polyols* identified most commonly in foods are mannitol and sorbitol, found in apples, pears, stone fruits, cauliflower, mushrooms, and snow peas. These polyols in addition to xylitol, isomalt, and others are also used as artificial sweeteners in, for example, sugar-free chewing gums and mints. Polyols, like fructose, are slowly absorbed along the length of the small bowel and are also likely to elicit an osmotic effect regardless of whether absorption is complete or not. Symptoms due to polyols are also independent of whether a proportion of them are malabsorbed.¹⁰ They too should, therefore, always be considered potential contributors to IBS symptoms, and breath hydrogen testing is non-informative.

At this point in time, low-FODMAP diet intervention has only been assessed as a dietitian directed therapy either one-on-one or in a group setting.^{11–16} The skills of a dietitian in dietary assessment, knowledge of FODMAP food composition and experience with the low-FODMAP dietary approach are likely to impact on

the success of the diet. The dietitian will take a detailed history of the patient's IBS symptoms and usual dietary intake. This includes gathering data on symptom type, severity, pattern, and frequency and details regarding usual FODMAP intake, fiber intake, meal pattern, and suspected trigger foods. FODMAP subtypes, dose and frequency of consumption, and their role in the patient's specific symptoms should be considered. The advice can be tailored accordingly. It is important that advice is given in the context of local dietary guidelines, to ensure nutritional adequacy, particularly intakes of fiber and calcium, which can be lowered when FODMAPs are restricted if alternative food choices are not encouraged.

In low-FODMAP diet research trials, symptoms are monitored using validated symptom tools. In practice, these are unnecessary, but monitoring patients' symptoms with some sort of assessment tool will assist in judging improvements and reminding the patient of the severity of their symptoms on their first visit. Rating specific symptoms such as bloating and abdominal pain on a scale of 1 to 10 can be useful, where 10 is the worst their symptoms have ever been. The Bristol stool scale can also be useful to monitor changes and to discuss with the patient appropriate stool form.¹⁷

Education and resources

A dietitian experienced in using the low-FODMAP diet will then have sufficient information to plan the dietary intervention. In many cases, a complete restriction of all FODMAP subtypes may be implemented, but a more individualized approach is designed in situations where (i) FODMAP intake is excessive, but symptoms are mild suggesting reasonable tolerance and low level of restriction required; (ii) lactose tolerance is known either through food challenge or a breath test, in which case dietary lactose is not restricted; (iii) patient has removed only a handful of foods from their diet with significant relief, such that a simplified food list or lists of specific FODMAP subtypes only is relevant; (iv) additional dietary restrictions are required because of other concurrent medical conditions such as diabetes, when the dietician needs to consider and prioritize all dietary requirements; or (v) cooking skills or living situation is likely to impact on the patient's ability to comply with the diet, in which case, a modified approach is warranted.

Success of the low-FODMAP diet has only been demonstrated through dietitian-delivered advice. There is now a lot of information available in books and online, but unfortunately, because of the evolving nature of the diet, much of this is out of date. As such, the source of information provided by the practitioner becomes an equally important part of the process.

There has been a huge amount of work translating the complex science of the low-FODMAP diet to practical user-friendly information, which includes development of color-coded written resources, mobile applications, online videos, social media outputs, and commercial food certification programs from respected clinical and research low-FODMAP diet experts across the world.

Follow up

The restriction phase of the low-FODMAP diet improves symptoms in up to 75% of patients within 6 weeks.^{11,14,16,18} The long-term goal of low-FODMAP diet education is to reintroduce

high-FODMAP foods to personal tolerance. Therefore, it is vital that patients are followed up approximately 4–6 weeks after the initial consultation to discuss the outcome of the dietary change, whether it has been successful or not. Detail on food reintroductions and long-term management is described elsewhere (see article in this issue by Tuck CJ & Barrett JS). For patients who do not improve, follow up is necessary to determine if the approach failed due to poor compliance, inadvertent intake of FODMAPs, alternative food intolerance, or non-diet-related mechanisms. A lack of response to the diet should be followed by high-FODMAP food challenges to confirm that symptoms are not due to FODMAPs, in which case, the diet should be discontinued.

FODMAPs are prebiotic and may be important in long-term gastrointestinal health. Recent research has highlighted the potential negative impact of a strict low-FODMAP diet on the intestinal microbiome.^{18,19} Therefore, the restrictive phase of the diet should only be continued until symptoms improve, usually within 4 weeks. After that, individual tolerance should be investigated through food challenge testing. Ideally, this will include reintroductions of small amounts of fructans and GOS, the FODMAPs with proven prebiotic activity.^{20,21} It is possible that the negative effects of a low-FODMAP diet are reversed by reintroducing only small amounts of FODMAPs into the diet while still controlling symptoms.

Conclusion

The low-FODMAP diet is an effective management strategy for IBS. Assessment and education by a dietitian, expert in management in gastrointestinal disorders, is key to the success of the diet, in addition to their use of up-to-date patient resources. At the initial education session, it is important that patients are made aware that the low-FODMAP diet is not a diet for life and that, once they have achieved symptomatic improvement, further dietitian direction will focus on food reintroductions and long-term management. The long-term goal is to find the balance between symptomatic improvements without potential negative effects on the dietary restriction.

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