STM JOURNALS

Research & Reviews: A Journal of
Pharmacology

https://journals.stmjournals.com/rrjop

ISSN: 2230-9861 (Online)
ISSN: 2349-1299 (Print)
Volume 15, Issue 2, 2025
May–August
DOI (Journal): 10.37591/RRJoP

Review RRJoP

A Review of the Role of Fiber Supplements in Digestive Health and Weight Management

Tariq Mehmood[1], Kamalesh Mistry[2,*], Dhananjay Mistry[3]

Abstract

The essential component of a nutritious diet is dietary fiber which enables body weight regulation and maintains digestive system health. Several supplements derived from fiber have gained popularity during recent years since they help improve gut health while controlling weight and preventing metabolic diseases. The two major groups which make up fiber are soluble and insoluble fibers that impact the body differently. The soluble fiber components psyllium inulin and beta-glucans form gelatinous substances in the digestive tract which slow down nutrient absorption and enhance blood sugar behaviors and strengthen beneficial microorganisms living in the digestive system. It is found in insoluble fiber components, such as cellulose and wheat bran that generate larger stool volumes which help with smooth bowel movements while benefiting gastrointestinal health. Dietary fiber consumption promotes satiation through two mechanisms that focus on stomach emptying speed as well as appetite hormone release to achieve reduced food consumption. Eating plenty of dietary fiber supports better lipid processing in the body while decreasing body fat accumulation and helping to avoid obesity-connected medical conditions. Recent scientific research demonstrates how prebiotic fibers shape the gut bacteria profiles to manage metabolic activities that affect weight regulation and health well-being. However, the same evidence shows that a person's ability to accept supplements depends on the fiber mixture alongside dosage levels and gut microbial variety. Excessive fiber intake might generate digestive symptoms, such as gas accumulation as well as stomach distension and modify the absorption patterns of nutrients in the body. The analysis examines modern research proving fiber supplements affect gut health and weight control and explore customized dietary therapies. Future research should work on developing optimal fiber formulations which will enable health professionals to prescribe the best dosage for specific populations to receive maximum benefits without adverse side effects.

Keywords: Fiber action, fiber supplements, soluble-partial fiber and insoluble-total fiber, gut health, bodyweight control, blood sugar and metabolism, gut microorganisms, prebiotic meals, fat transformation, and disease management

***Author for Correspondence**
Kamalesh Mistry
E-mail: drkamaleshmistry@gmail.com

[1]Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh, Rajasthan, India
[2]Assistant Professor, Department of Pharmacy, Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh, Rajasthan, India
[3]Lecturer, Department of Pharmacy, Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh, Rajasthan, India

Received Date: March 26, 2025
Accepted Date: April 07, 2025
Published Date: June 16, 2025

Citation: Tariq Mehmood, Kamalesh Mistry, Dhananjay Mistry. A Review of the Role of Fiber Supplements in Digestive Health and Weight Management. Research & Reviews: A Journal of Pharmacology. 2025; 15(2): 24–35p.

INTRODUCTION

Human nutrition depends on dietary fiber as the substance essential for maintaining digestive health and controlling body weight. The non-digestible carbohydrate and lignin in dietary fiber form part of the resistant substances that cannot be broken down by gastrointestinal tract enzymes. Fiber is divided primarily into two kinds called soluble and insoluble according to its water reaction behavior. Water-soluble fiber found in psyllium as well as inulin and beta-glucans create a gel substance that delays digestion and boosts diversity of gut microbiota. Whole grains and wheat bran and vegetables include insoluble fiber which provides bulk to stomach content to establish regular bowel movements and prevent constipation [1]. The

modern dietary patterns showing low-fiber content make dietary fiber supplements highly popular because they ensure both dietary fiber adequacy and overall well-being. Evidence confirms that gut health strongly depends on dietary fiber. The modulatory properties of soluble fiber strengthen stool consistency while retaining water that treats both diarrhea and constipation symptoms. The substance also functions as prebiotic matter because it supports beneficial gut bacteria to multiply which in turn helps strengthen gastrointestinal integrity and reduce inflammatory responses [2]. Higher stool bulk together with faster intestinal movement are benefits of insoluble fiber that help prevent diverticular disease while reducing colorectal illness [3]. Research shows that fiber stands as an essential treatment approach for patients who have irritable bowel syndrome (IBS), inflammatory bowel disease (IBD) and functional constipation [4]. Outside of gastrointestinal health, weight control has been the subject of extensive research into the effects of fiber supplements. One of the most important mechanisms by which fiber as Weight management stands as one of the extensively researched outcomes on how fiber supplements impact body health. The key process through which fiber helps weight management is its ability to make people feel full longer. Consuming soluble fibers causes delayed stomach emptying functions that simultaneously increase the hormone release of glucagon-like peptide-1 (GLP-1) and peptide YY (PYY) thereby reducing total caloric intake [5]. The metabolic effects of diet fiber include reducing cholesterol absorption and optimizing bile acid release for potential improvements in body fat storage and metabolic status [6]. A fiber-rich diet decreases obesity risks and improves insulin response while decreasing the occurrence of metabolic syndrome [7]. Fiber supplementation generates benefits across different individuals based on fiber type consumption together with gut microbiome traits and general eating behavior while these advantages show variation among each individual patient. Higher amounts of fiber in the diet could result in gastrointestinal issues as well as bloating together with changes in how the body absorbs nutrients [8]. Tailored dietary approaches should be established because they enable optimal fiber supplement effectiveness together with minimizing undesirable consequences. sists with weight regulation is by increasing satiety. Soluble fibers delay gastric emptying and augment the release of satiety hormones, like glucagon-like peptide-1 (GLP-1) and peptide YY (PYY), resulting in lowered calorie consumption [5]. Diet fiber also modulates lipid metabolism by lowering cholesterol absorption and improving bile acid secretion, which might help lower body fat storage and enhance metabolic status [6]. Furthermore, fiber-rich diets have been linked to reduced obesity risk, improved insulin sensitivity, and lower prevalence of metabolic syndrome [7]. Despite these benefits, the effects of fiber supplementation vary among individuals depending on factors, such as fiber type, dosage, gut microbiome composition, and overall dietary patterns. Some individuals may experience gastrointestinal discomfort, bloating, or altering nutrient absorption due to excessive fiber intake [8]. Hence, individualized dietary strategies are required to maximize the benefits of fiber supplementation and avoid potential side effects.

TYPES AND SOURCES OF FIBER SUPPLEMENTS

The essential dietary component of fiber plays an important role in digestive health and weight management while modifying gut processes as well as metabolism and hunger control. The decline in fiber consumption during recent years has led to fiber supplements becoming popular because they help increase fiber consumption while providing health advantages [1]. Different forms of supplemental fiber material have distinct ways of influencing gastrointestinal tract function and distinct origins. You must understand fiber types before selecting a supplement according to your health needs and digestive system state and metabolic processes.

Fiber Supplement Categorization

Supplements made from fiber exist in two water-soluble forms called soluble fiber and insoluble fiber with clear benefits for digestion and metabolism.

Soluble Fiber Supplements

The body absorbs soluble fiber, and this substance turns into a smooth substance inside the digestive system. The substance slows down stomach emptying while helping control blood sugar levels and hunger pangs plus supports gut microorganisms [6]. Scientists have tested soluble fiber to show its

power in lowering cholesterol and blood sugar levels plus enhancing digestion [2]. People can take several soluble fiber supplements which are:

- *Psyllium (Plantago ovata husk):* People usually take psyllium for constipation and irritable bowel syndrome since its plant-based husk from Plantago ovata seeds absorb water well. Women who take psyllium supplements can decrease harmful LDL cholesterol levels while managing blood sugar and losing weight thanks to its feeling-full effect according to research [4].
- *Inulin and Fructooligosaccharides (FOS):* Healthy gut bacteria Bifidobacteria and Lactobacilli develop when the stomach consumes inulin and FOS which doctors extract from chicory root. These fibers expand the number of good gut bacteria while making it easier for the body to absorb minerals and process waste. When people supplement with inulin their digestive system and appetite management improve [3].
- *Beta-Glucans:* These viscous soluble fibers taken from oats, barley, and specific types of fungi include beta-glucans which help lower cholesterol and strengthen immune function while managing blood sugar changes. The consumption of beta-glucan supplements helps lower metabolic syndrome risks and strengthens cardiovascular well-being [5].
- *Pectins:* Pectins from apples and citrus fruits act as gel fibers in the stomach to prevent cholesterol absorption and improve gut bacteria with their fiber content. Doctors prescribe pectin supplements to patients who have diabetes or gastrointestinal conditions combined with high cholesterol problems [7].
- *Guar Gum:* Guar beans produce Guar Gum which serves as a common food thickening ingredient. Scientific studies show this substance makes stools easier to move through the body while keeping you satisfied longer after meals and reducing blood sugar spikes which help both your digestive organs and weight loss efforts [8].

Insoluble Fiber Supplements

Insoluble fiber does not dissolve in water but creates thicker stool and speeds up intestinal passage both reducing constipation and supporting daily bowel functions. People with slow intestinal transit plus hemorrhoids and diverticular disease should take insoluble fiber supplements because they work best in these cases [9]. Some common forms are,

- *Cellulose:* Plant cell wall cellulose makes stools bulkier and moves bowel movements through the digestive system more smoothly. People suitable it from plant-based food items plus sources obtained from wood pulp or cottonseed [10].
- *Hemicellulose:* Hemicellulose serves as a non-cellulosic polysaccharide from whole grains and cereals to help digestive health through water uptake in the gut and keeps stools soft.
- *Lignin:* Unlike other fibers, lignin exists only in woody plants nuts and seeds because it does not contain any carbohydrates. The antioxidant properties of lignin support gut health while limiting colorectal cancer development according to medical research [11].
- *Wheat Bran:* People use wheat bran supplements derived from wheat grains' outer part because they increase bowel movements and treat constipation effectively while preventing diverticulosis [12].

FIBER SUPPLEMENT SOURCES

Fiber supplements come from different natural and synthetic sources, depending on their desired health benefits and functional qualities.

Plant Sources

Plant-based supplements contain fibers that present both types of fiber to support digestive function as well as metabolic health.

- *Cereal Grains (Oats, Barley, Wheat, and Rye):* The cereal grains including oats and barley as well as wheat and rye contain beta-glucans along with cellulose and hemicellulose that help lower cholesterol while benefiting gut health and regulating blood sugar [13].
- *Legumes (Beans, Lentils, Chickpeas, and Peas):* Legumes including beans and peas as well as lentils and chickpeas contain soluble and insoluble fibers with pectins and resistant starch that promote healthy digestion and provide extended feelings of fullness [14].

- *Fruit and Vegetables (Apples, Citrus Fruits, Carrots, and Broccoli):* Dietary fibers in Apples and Citrus Fruits with Carrots and Broccoli deliver pectins and inulin and lignin which support gut microbial health with blood glucose control and heart health [15].
- *Psyllium Husk (Plantago ovata):* The seed husk product of Plantago ovata forms Psyllium Husk which stands as one of the most popular natural supplements for regulating digestion while lowering cholesterol [16].
- *Chicory Root (Source of Inulin and FOS):* Research shows that Chicory Root extracts from its root provide Inulin and FOS compounds which benefit gut microbiome health and help optimal mineral absorption [17].

Synthetic and Isolated Fiber Sources

Fiber supplements might need synthetic processing to enhance functional benefits although natural fibers provide additional nutrients and antioxidants.

- *Methylcellulose:* The soluble fiber component in laxatives under the name of methylcellulose derives from cellulose and incorporates modifications through chemical processes [18].
- *Polydextrose:* Polydextrose serves as a produced fiber material used in processed foods and supplements which enhances stool bulk while benefiting intestinal well-being and creating a sense of fullness [19].
- *Resistant Starch:* Manufacturers produce resistant starch as a prebiotic fiber through synthetic methods alongside its natural extraction from foods because this substance improves both insulin sensitivity and gut microbiota diversity [20].

FIBER SUPPLEMENTS AND DIGESTIVE HEALTH

Dietary fiber takes central position in gastrointestinal wellness because it enhances gut movement while helping preserve microbial equilibrium and stopping several gastrointestinal tract affections. Many people miss out on daily fiber recommendations without knowing how this causes digestive problems including constipation along with bowel irregularities and inadequate gut microbial balance [1]. Supplements with fiber function as an efficient means for those unable to reach their fiber goals since they bring various advantages for digestive health. People experience varying benefits from fiber supplements depending on their type and origin along with their individual bodily reactions.

Role of Fiber in Digestive Function

The incorporation of fiber supplements promotes digestive health through their influence on bowel movement control combined with improved gut microbe equilibrium and fermentation support and avoidance of digestive illnesses. Soluble fiber together with insoluble fiber comprises the primary types of dietary fiber and controls the GI tract throughout the body in different ways.

- *Soluble Fiber:* The combination of soluble fiber with water creates a gel substance that slows down digestion while creating softer stools and benefits prebiotic bacteria in the gut [21].
- *Insoluble Fiber:* A type of fiber known as insoluble activates stool bulk and accelerates intestinal movement thereby preventing constipation through its ability to shape waste material in the colon [4].

Effect of Fiber Supplements on Bowel Movements and Stool Consistency

Regular, healthy bowel movements are important for digestive health and toxin expulsion. Fiber supplements improve stool consistency and frequency and can relieve common GI symptoms like constipation and diarrhea.

- *Constipation Relief:* Psyllium is a very common type of soluble fiber that has been shown to improve stool frequency and stool water content and is therefore considered a first-line treatment for chronic constipation [22]. Studies show that psyllium improves stool consistency better than wheat bran by forming a gel and retaining water in the intestines [23].
- *Diarrhea Control:* Fiber supplements including pectin and guar gum absorb water in the intestines and result in thicker stools and slower transit time of the bowels. This makes them

helpful in patients with symptoms of irritable bowel syndrome (IBS) or inflammatory bowel disease (IBD) [24].

FIBER SUPPLEMENTS AND GUT MICROBIOTA MODULATION

The gut microbiome is a significant factor affecting digestive health, immune health, and nutrient metabolism. Fiber supplements, specifically prebiotic fibers, provide a source of nutrients that are beneficial to gut bacteria health, thus leading to an ideal composition of the gut microbiome [25].

- *Prebiotic Effects:* Inulin, oligofructose, and resistant starch stimulate the selective growth of gut bacteria that are beneficial to gut health, specifically Bifidobacteria and Lactobacilli [26].
- *Fermentation and Short-chain Fatty Acid (SCFA) Production:* Soluble fiber is fermented in the colon to produce SCFAs, such as butyrate, acetate, and propionate, which support gut pH, intestinal integrity, and reduce inflammation [27].
- *Reduction of Gut Dysbiosis:* Fiber supplements increase microbial diversity to reduce overgrowth of pathogenic bacteria associated with dysbiosis and contribute to inflammation and metabolic disease [28].

Role of Fiber Supplements in Gastrointestinal Disorder Management

Certain GI disorders, such as irritable bowel syndrome (IBS), inflammatory bowel disease (IBD), diverticulosis, and acid reflux, can be effectively treated with fiber supplementation.

Irritable Bowel Syndrome

IBS is a common GI disorder that is usually accompanied by abdominal pain, bloating, and abnormal bowel habits. The evidence suggests that

- Psyllium is the best supplemental fiber for IBS because it improves stool consistency without excessive gas and bloating [29].
- Inulin and FOS (fructooligosaccharides), while prebiotic, can sometimes provoke symptoms in patients with IBS, because they generate too much gas [30].

Inflammatory Bowel Disease (IBD)

IBD, usually manifesting as Crohn's disease and ulcerative colitis, is characterized by chronic inflammation of the lining of the GI tract. Otherwise, psyllium and oat bran are supplemental fiber that has been shown to,

- Reduce inflammation of the intestines through stimulating production of butyrate, a butyrate, a short-chain fatty acid, used for enhancing the GI barrier [31].
- Improve stool consistency without excessive irritation of inflamed intestines [32].

Diverticulosis and Diverticulitis

Diverticulosis occurs when small pouches develop in the colon wall and is linked to low fiber diets. Insoluble fiber supplements, such as wheat bran and cellulose may increase the amount of stool bulk, and this reduces pressure in the colon, thus preventing diverticular disease [33].

Gastroesophageal Reflux Disease (GERD) and Acid Reflux

Fiber intake has been associated with a lower susceptibility to symptoms of acid reflux due to promoting gastric emptying and preventing over pressure in the stomach [34]. The research shows that Psyllium supplements improve GERD symptoms by aiding digestion and preventing bloating after eating [35]. Dietary fiber reduces susceptibility to acid reflux attacks, especially in subjects who are obese [36].

Potential Side Effects and Precautions

While fiber supplements provide numerous positive contributions to digestive wellness, excessive use or consumption of fiber supplements can lead to adverse effects. These effects can include:

- *Gas and Bloating:* Certain short-chain fibers, particularly inulin and FOS, can suddenly ferment and lead to excess gas production in people who have a sensitivity [37].

- *Intestinal Cramping and Discomfort:* Some insoluble fiber supplements, such as wheat bran, can lead to abdominal cramping or discomfort, especially in those with IBS or IBD [38].
- *Lack of Nutrient Absorption:* High fiber consumption can interfere with the absorption of critical minerals that the body needs, such as calcium, iron, and zinc [39].
- *Hydration Issue:* Fiber also intrinsically binds water within the gastrointestinal tract, and proper hydration must be consumed to prevent constipation [3].

FIBER SUPPLEMENTS AND WEIGHT MANAGEMENT

Controlling one's weight is a global health issue, and rates of obesity and metabolic disease are rising. Dietary fiber is important in controlling weight due to its effects on appetite suppression, low-calorie meal consumption, improving metabolism, and absorption of fat [1]. Nevertheless, too few people consume the recommended daily intake of fiber, which has led to interest in fiber supplementation as an easy way to help with weight loss and weight maintenance [21].

Fiber Supplementation Mechanisms for Weight Management

Fiber supplements exert their effects on weight management via several mechanisms.

- Increased satiation and appetite suppression.
- Reduced overall caloric consumption.
- Slowed digestion and improved regulation of glucose in the body.
- Microbiota regulation and fatty acid metabolism.

These mechanisms together work to suppress excessive weight gain and are effective for long-term weight management [4].

Fiber Supplementation That Decreases Appetite

One of the primary mechanisms by which fiber supplements assist in weight management is the enhancement of satiety and inhibition of hunger cues. Soluble fiber, such as psyllium, glucomannan, and pectin, produces a gel-like substance upon entering the stomach, which delays the speed of gastric emptying, leading to prolonged feelings of fullness [22]. In obese individuals, supplementation of psyllium was found to significantly increase satiety and decrease calories consumed afterward [23]. Glucomannan is a very viscous fiber that swells in the stomach and slows digestion, reducing appetite and overall food intake [24]. Prebiotic fibers, like inulin stimulate gut hormones, such as peptide YY (PYY) and glucagon-like peptide-1 (GLP-1), which promote satiety by suppressing hunger messages [25]. Fiber supplements increase satiety, both of which play an important role in portion control and preventing binge eating, which is critical in weight loss.

Reduction in Caloric Intake and Energy Absorption

Fiber supplements contribute to weight management by reducing overall energy intake and decreasing caloric absorption. High-fiber diets and fiber supplements are low-energy density approaches and have fewer calories per gram, which, in turn, contributes to volumizing a meal and thus less overall energy intake [26]. Certain fibers, like pectin and guar gum, bind dietary fats and bile acids in the intestine, limiting fat absorption and enhancing fecal fat excretion [27]. Soluble fibers slow the digestion and absorption of carbohydrates, yielding a slower rise in blood glucose levels and curbing hunger spikes [28]. Increased fiber intake is associated with lower body weight and risk of obesity, because foods high in fiber lower energy intake automatically over the long term [29].

MODIFICATION OF GUT MICROBIOTA AND METABOLIZATION OF FAT

Recent research suggests fiber supplements support weight regulation via modulation of gut microbiota. The gut microbiome impacts energy extraction, fat storage, and metabolic control, while fiber acts as a prebiotic that provides nourishment for beneficial gut bacteria [38]. Prebiotic fibers, like inulin and fructooligosaccharides (FOS), specifically stimulate the growth of beneficial gut bacteria (e.g., Bifidobacteria and Lactobacilli), which are associated with reduced body weight [39]. Gut

microbiota ferments fiber to produce short-chain fatty acids (SCFAs), such as butyrate and propionate, that modulate fat metabolism, reduce inflammation, and suppress appetite [40]. A diet high in fiber alters the gut microbiota composition by decreasing the Firmicutes to Bacteroidetes ratio, a microbiota profile change linked to decreased fat storage and lower body weight [41]. Fiber supplements are one intervention that promotes a healthy gut microbiota that improves metabolic efficiency and energy regulation as they pertain to long-term weight management.

Glucose Regulation and Insulin Sensitivity

In the prevention of obesity and weight management, glucose regulation is significant. Fiber supplements regulate glucose metabolism and insulin sensitivity that is necessary for limiting extra fat storage and promoting breakdown of fat [42]. Psyllium supplementation has demonstrated decreased postprandial glucose and insulin levels and increased metabolic efficiency [43]. Beta-glucan, found in oats and barley, slows carbohydrate absorption and insulin peaks and it decreases cravings for high-calorie foods [44]. Resistant starch increases fat oxidation while decreasing insulin resistance and is beneficial for weight loss and metabolic health [45]. Fiber supplements assist in effective and sustainable weight management by stabilizing blood glucose levels and decreasing fat storage associated with insulin effect.

Clinical Evidence for the Use of Fiber Supplements for Weight Loss

Numerous clinical trials and meta-analyses have demonstrated the efficacy of fiber supplements in the maintenance of weight. A meta-analysis of 62 randomized controlled trials found that fiber supplementation significantly reduced body weight, BMI, and waist circumference in overweight and obese adults [46]. A 12-week study of glucomannan supplementation resulted in an average weight loss of 2.5 kg (5.5 lbs.) in overweight adults, all without severe dietary restriction [47]. The supplementation of psyllium was found to reduce total daily calorie intake by 10%, contributing to weight loss [48]. These findings support the use of fiber supplementation for weight loss and prevention of obesity as part of a healthy eating plan and regular exercise.

Potential Risks and Side Effects

Fiber supplements offer many benefits in maintaining digestive and weight health but may pose some risks and side effects when taken excessively or inappropriately. These effects span from mild gastrointestinal discomfort to more serious complications, especially for individuals with underlying diseases.

GASTROINTESTINAL DISCOMFORT

The most reported side effect of fiber supplements is abdominal cramping, bloating, and gas. Soluble fibers, like psyllium and inulin, are fermented by gut bacteria, causing gas production [1]. Although insoluble fibers add bulk to stool, they may cause discomfort if they are introduced to the diet too fast. A gradual increase in fiber consumption and adequate hydration would mitigate these [8].

Diarrhea and Constipation

Fiber is necessary for maintaining bowel regularity, but too much fiber, with a short water intake, can lead to constipation. Fiber absorbs water, and thus if there is not enough water present, stools will become hard and dry [49]. Conversely, some soluble fibers, such as guar gum and wheat dextrin that may be used in fiber supplements, may pull excess moisture into the intestines causing diarrhea or loose stools [50].

Impairment of Mineral Absorption

Fiber supplements, including those high in insoluble fiber, may interfere with the absorption of essential minerals like calcium, iron, and/or zinc. This is due to fiber's ability to bind to these minerals in the gastrointestinal (GI) tract, reducing their bioavailability [51]. Long-term excessive fiber consumption, with limited consumption of nutrient-dense foods, can lead to deficiencies in these minerals, especially in patients with restrictive diets or malabsorption.

Drug Interaction Potential

Fiber can impact the absorption and efficacy of some medications. For example, soluble fiber delays the gastric emptying process, leading to lower rates of drug absorption of medications for diabetes (e.g., metformin), cholesterol-lowering statins, and some antidepressants [52]. To minimize interference, most fiber supplements should be taken either one to two hours prior to consuming medications, or at least one to two hours post-medications [6].

Aggravation of Underlying GI Disorders

Those with existing à la mode GI disorders, such as irritable bowel syndrome (IBS) or inflammatory bowel disease (IBD) should be cautious in incorporating fiber supplements. Certain fibers, particularly FODMAPs, may aggravate symptoms of bloating, cramping, and/or diarrhea in some individuals [53].

Recommended Dosage and Best Practices

To achieve the maximum benefit to digestive function and weight management from fiber supplementation along with the least chance of side effects, it is important to use the right dosage and dispense fiber properly. The recommended intake differs from individual to individual (depending on nutritional requirements, medical conditions, and type of fiber).

General Recommendations for Dosage

As reported by the Institute of Medicine [54], adult women should have a total daily intake of 25 grams of fiber and men should have a total daily intake of 38 grams. However, people must have much more than this. Most adults get much less than this. If fiber supplements are used, starting low is suggested, and taking a gradual increase in dosage (ex: 5 grams a day) to avoid gastrointestinal discomfort, like bloating and gas [55]. Individuals who use fiber supplements as a weight loss aid, studies indicate that an extra 10 to 15 grams of fiber per day can also produce a feeling of satiety and decrease kcal intake [56].

IMPORTANCE OF FLUID

Good fluid intake is always required while using fiber supplements. After fiber absorbs the fluid in the gut, the fiber will swell in the gut and create stool and will promote bowel movement. If there is not enough fluid consumed, constipation will occur along with discomfort [49]. While increasing fiber intake, drink at least 8 glasses (2 liters) of water a day to help balance the digestive tract [57].

Choosing the Right Fiber Type

Different types of fiber supplements can also influence digestion and metabolism in different ways. Psyllium husk (as a type of soluble fiber) is particularly beneficial for both constipation relief and weight management, as it can help thicken to a gel-like consistency in the intestines and contribute to feelings of fullness [58]. Other prebiotic fibers, such as inulin and oligofructose contribute to the health of gut microbiota but may also temporarily cause bloating for some consumers [26]. For individuals with irritable bowel syndrome (IBS), low FODMAP fiber (partially hydrolyzed guar gum, or PHGG) may be tolerated [53].

Medication Timing and Interactions

Fiber supplements should be consumed either at least 1 to 2 hours before medications, or 1 to 2 hours after medications to avoid interference with absorption. Some fibers, particularly viscous fibers (e.g. psyllium) can delay absorption of some medications like diabetes medications, statins, and some antidepressants [6].

Gradually Introduction and Logging Fiber

Consumption Fiber should be introduced gradually (over the course of one to two weeks) instead of abruptly increasing consumption to avoid digestive upset. A food and symptom diary can be helpful to encourage and support both tracking tolerance levels of fiber, and if you want to adjust the quantity of fiber accordingly [59].

FUTURE PERSPECTIVES AND RESEARCH DIRECTIONS

The role of fiber supplementation in weight and gut health is a constantly growing and changing area of investigation. Plentiful studies currently show beneficial outcomes of fiber for gut health, satiety, and metabolism. However, future studies will further clear the air on fiber type, personal responses, and innovative uses in disease prevention or disease therapy.

Personalized Nutrition and Gut Microbiota

New studies suggest fiber supplementation must be personalized to the gut microbiome composition of the individual. Individuals showed variable responses to fiber supplementation due to gut bacteria that affect digestion, fermentation, and metabolic effects [60]. Future research would be to develop microbiome-based approaches to optimize dietary fiber supplementation to achieve health objectives (e.g., weight loss, gut health, gastrointestinal diseases) [61].

Role of Fiber in Metabolic and Inflammatory Diseases

In addition to weight control and digestive support, fiber supplementation may have substantial impacts on metabolic disease like type 2 diabetes, as well as cardiovascular disease. Available evidence indicates some fibers (e.g., beta-glucans, resistant starch) lead to improved glycemic control and cholesterol levels (38). While additional studies are required, long-term prevention of metabolic syndrome and chronic inflammation through fiber supplementation require further investigation [62].

Progression of Advanced Fiber Supplementation

Development in the future will likely focus on fiber supplements with more functional action. This would include prebiotic fibers selected for their specific impact on feeding good gut bacteria and symbiotic products combining fiber and probiotics for enhanced health in the gut [26]. More attention to studying new fiber sources with distinct digestion characteristics is gaining interest, including bioengineered fibers originating from plants and polysaccharides originating from seaweed [63].

Safety over Time and Dose Characteristics

Fiber is relatively safe, but additional research would warrant information pertaining to long-term effects especially with higher dosing. There have been concerns about high fiber affecting mineral absorption and gut stability of that gut barrier [64]. Additional research in the future should also include examining optimal doses across different groups, such as older adults, people with a gastrointestinal disease, and athletes' behaviors when energy expenditure is high [47].

CONCLUSIONS

In conclusion, fiber supplements have an important role in enhancing digestive health as well as in supporting weight management. Fiber is a vital part of a balanced diet, and it has many benefits for digestive health. For example, it can promote bowel regularity, help prevent constipation and manage conditions, such as irritable bowel (IBS) and diverticulosis, by increasing stool bulk and softness to allow for ease of passage through the gastrointestinal tract and minimize discomfort while supporting gut health. Fiber supplements also help promote weight management through multiple pathways. They could increase fullness (satiety), which helps control calorie intake, reduce consumption, and help with weight loss or weight management. Fiber, especially soluble fiber, slows nutrient absorption, reduces the risk of rapid blood sugar spikes, and helps regulate appetite, which may be beneficial to those having metabolic issues, such as insulin resistance or type 2 diabetes. However, fiber supplements are not meant to replace whole foods containing nutrition that is not available through fiber supplements. For instance, whole grains, fruit, vegetables, legumes and seeds are good sources of soluble and insoluble fiber, as well as vitamins, minerals, and antioxidants that promote health in the long term.

Fiber supplements are a necessary part of weight management and digestive health through promoting regular bowel function, increasing gut microbiota diversity, and increasing satiety to control calories. Fibers come in three forms: soluble, insoluble, and prebiotic, and each provides a unique benefit – so the choice of which to use is important to consider based on individual dietary needs and

disease state. Daily fiber intake is associated with better gastrointestinal function, reduced risk of obesity, and improved metabolic regulation, which also shows the need for fiber as part of a balanced diet. While high amounts of fiber provide many advantages to health, it is important to educate yourself and use fiber supplements with care. If high amounts of fiber are taken without drinking enough water, gastrointestinal side effects, such as bloating, gas, constipation or diarrhea can occur. Also, some fiber supplements may bind nutrients and/or interfere with effectiveness medications; thus, it is important to make sure that you are adequately informed on the consumption of fiber supplements. Also, anyone with a gastrointestinal condition, like irritable bowel syndrome (IBS), or inflammatory bowel disease (IBD), needs to take an especially cautious approach to type of fiber consumption, since this may worsen their symptoms. To reduce the possibility of any gastrointestinal side effects, you want to be sure to slowly increase your fiber intake consumption and fluid intake.

REFERENCES

1. Slavin JL. The relationship between dietary fiber and weight. Nutrition. 2005;21(3):411–8.
2. Holscher HD. Dietary fiber and prebiotics in relation to the gut microbiota. Gut Microbes. 2017;8(2):172–84.
3. Dahl WJ, Stewart ML. Dietary fiber and weight. Position of the Academy of Nutrition and Dietetics. J Acad Nutr Diet. 2015;115(11):1861–70.
4. Eswaran S, Muir J, Chey WD. Functional gastrointestinal disorders and dietary fiber. Am J Gastroenterol. 2013;108(5):718–27.
5. Wanders AJ, van den Borne JJGC, de Graaf C, et al. Dietary fiber and energy intake, subjective appetite, and body weight. Nutr Rev. 2011;69(9):548–66.
6. Anderson JW, Baird P, Davis RH, et al. Health benefits of dietary fiber. Nutr Rev. 2009;67(4):188–205.
7. Pereira MA, Ludwig DS. Dietary fiber and body-weight regulation. Pediatrics. 2001;108(3):797–806.
8. McRorie JW, McKeown NM. Understanding the physics of functional fibers in the gastrointestinal tract: An evidence-based approach to address chronic misunderstandings about insoluble and soluble fiber. J Acad Nutr Diet. 2017;117(2):251–64.
9. Howarth NC, Saltzman E, Roberts SB. Dietary fiber and weight regulation. Nutr Rev. 2001;59(5):129–39.
10. Jenkins DJ, Kendall CW, Vuksan V. Viscous fibers, health claims and cardiovascular disease risk reduction. J Am Med Assoc. 2000;84(12):1303–12.
11. Anderson JW, Randles KM, Kendall CW, Jenkins DJ. Carbohydrate and fiber recommendations for individuals with diabetes: a quantitative assessment and meta-analysis of the evidence. J Am Coll Nutr. 2004;23(1):5–17.
12. Marlett JA, McBurney MI, Slavin JL. Position of the American Dietetic Association: Health implications of dietary fiber. J Am Diet Assoc. 2002;102(7):993–1000.
13. Brown L, Rosner B, Willett WW, Sacks FM. Cholesterol-lowering effects of dietary fiber: A meta-analysis. Am J Clin Nutr. 1999;69(1):30–42.
14. Delzenne NM, Neyrinck AM, Cani PD. Can the gut microbiota be modulated by pre- and probiotics? A new avenue of treatment for obesity? Nat Rev Endocrinol. 2011;7(11):639–46.
15. Maki KC, Beiseigel JM, Jonnalagadda SS, et al. Whole-grain intake is associated with weight-related measures among older adults: findings from the Baltimore Longitudinal Study of Aging. J Am Diet Assoc. 2010;110(11):1686–92.
16. Tungland BC, Meyer D. Nondigestible oligo- and polysaccharides (dietary fiber): their physiology and role in human health and food. Compr Rev Food Sci Food Saf. 2002;1(3):90–109.
17. King DE, Mainous AG 3rd, Lambourne CA. Trends in dietary fiber intake in the United States, 1999-2008. J Acad Nutr Diet. 2012;112(5):642–8.
18. McRorie JW. Evidence-based consideration of fiber supplements and clinically relevant health benefits, Part 1: What to note and how to recommend an effective fiber therapy. Nutr Today. 2015;50(2):82–9.

19. Weickert MO, Pfeiffer AF. Metabolic effects of dietary fiber consumption and prevention of diabetes. J Nutr. 2008;138(3):439–42.
20. Cummings JH, Stephen AM. Carbohydrate terminology and classification. Eur J Clin Nutr. 2007;61(1):S5–S18.
21. McRorie JW, Chey WD. Fiber and bowel function. Gastroenterology. 2016;150(6):1230–34.
22. Suares NC, Ford AC. Systematic review: the effects of fibre supplementation on chronic constipation. Aliment Ther. 2011;33(8):895–901.
23. Khalif IL, Quigley EM, Konovitch EA. Maximova ID published a randomized, controlled trial on the effectiveness of fiber supplements for functional constipation in Gut. 1998;42(2):216–21.
24. Murray K, Wilkinson-Smith V, Hoad C, et al. published an article discussing the variability of fibers on colonic transit and constipation-predominant irritable bowel syndrome symptoms in Gastroenterology. 2019;157(4):1093–103.
25. Holscher HD wrote an article on dietary fiber and prebiotics in Gut Microbes, 2017;8(2):172–184.
26. Gibson GR, Hutkins R, Sanders ME, et al. released the International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on prebiotics in Nat Rev Gastroenterol Hepatol. 2017;14(8):491–502.
27. Cummings JH, Pomare EW, Branch WJ, Naylor CP, MacFarlane GT published a study on short-chain fatty acids in the human large intestine, portal, hepatic, and venous blood in the journal Gut in 1987;28(10):1221–7.
28. David LA, Maurice CF, Carmody RN, et al. showed that diet alters the human microbiome (rapidly and reproducibly) in Nature. 2014;505(7484):559–63.
29. Moayyedi P, Quigley EM, Lacy BE, et al. concluded that dietary fiber supplementation does influence irritable bowel syndrome in American Journal of Gastroenterology. 2014;109(9):1367–74.
30. Hustoft TN, Hausken T, Ystad SO, et al. studied dietary fructo-oligosaccharides in irritable bowel syndrome in Neurogastroenterol Motil. 2017;29(3):e12911.
31. Benjamin JL, Hedin CR, Koutsoumpas A, et al. A clinical trial of fructo-oligosaccharides therapy in active Crohn's disease: a randomized, double blind, placebo-controlled trial. Gut. 2011;60(7):923–9.
32. Kasubuchi M, Hasegawa S, Hiramatsu T, Ichimura A, Kimura I. Short-chain fatty acids, dietary gut microbial metabolites, and regulation of host metabolism. Nutrients. 2015;7(4):2839–49.
33. Peery AF, Sandler RS. Diverticular disease: a new look at conventional wisdom. Clin Gastroenterol Hepatol. 2013;11(12):1532–37.
34. El-Serag HB, Sweet S, Winchester CC, Dent J. Update on the epidemiology of gastro-esophageal reflux disease; a systematic review. Gut. 2014;63(6):871–80.
35. Cordero OJ, Salgado FJ, Nogueira M. Dietary fiber and interactions with the human immune system. Adv Nutr. 2011;2(6):557–63.
36. Bohn T, Carriere F, Day L, et al. Recent advances on dietary fiber and interactions with nutrients. Crit Rev Food Sci Nutr. 2021;61(17):2783–801.
37. Van der Beek CM, Canfora EE, Kip AM, et al. The prebiotic inulin improves gut microbiota composition and gut permeability in patients with Crohn's disease. Gastroenterology. 2018;154(4):871–5.
38. Weickert MO, Pfeiffer AF. The metabolic impact of dietary fiber consumption and diabetes prevention. J Nutr. 2008;138(3):439–42.
39. Stephen AM, Champ MM, Cloran SJ, et al. Dietary fiber in Europe: current state of knowledge on definitions, sources, recommendations, intakes, and health relations. Nutr Res Rev. 2017;30(2):149–90.
40. Dahl WJ, Stewart ML. Fiber and obesity prevention. J Acad Nutr Diet 2015;115(11):1861–1870.
41. Turnbaugh PJ, Ley RE, Mahowald MA, et al. Gut microbiome associated with obesity has increased capacity for energy harvest. Nature. 2006;444(7122):1027–31.
42. Jenkins DJ, Axelsen M, Kendall CW, et al. Dietary fiber, glycemic response and diabetes. Am J Clin Nutr. 2000;71(6):1437–45.
43. Pal S, Khossousi A, Binns C, Dhaliwal S, Ellis V. Psyllium fiber effects on postprandial glucose and insulin responses in overweight/obese individuals. J Am Coll Nutr. 2011;30(3):210–16.

44. Nilsson AC, Ostman EM, Holst JJ, Bjorck IM. Indigestible carbohydrates included in diet reduce insulin resistance in obesity. Am J Clin Nutr. 2008;87(6):1506–13.
45. Robertson MD, Bickerton AS, Dennis AL, Vidal H, Frayn KN. Effects of dietary resistant starch on insulin sensitivity and metabolism in skeletal muscle and adipose tissue. Am J Clin Nutr. 2005;82(3):559–67.
46. Clark MJ, Slavin JL. Effects of fiber on satiety and food intake: a systematic review. J Am Coll Nutr. 2013;32(3):200–11.
47. Keithley J, Swanson B. Glucomannan and obesity: a review of the evidence. Altern Ther Health Med. 2005;11(6):30–34.
48. Kristensen M, Jensen MG. A fiber supplement reduces appetite and decreases energy intake. Obesity (Silver Spring). 2011;19(2):376–82.
49. Eswaran S, Muir J, Chey WD. Fiber and functional gastrointestinal disorders. Am J Gastroenterol. 2013;108(5):718–27.
50. Mäkivuokko H, Kettunen H, Saarinen M, et al. The impact of soluble fiber on the gut microbiota profile. Mol Nutr Food Res. 2010;54(1):37–48.
51. Weaver CM. Availability of trace minerals from cereals and legumes. Br J Nutr. 2010;104(S1): S91–S96.
52. Jenkins DJ, Kendall CW, Vuksan V. Viscous fiber and its metabolic consequences. Am J Clin Nutr. 2000;71(6):1437–45.
53. Staudacher HM, Irving PM, Lomer MC, et al. Pathophysiological mechanisms and beneficial effects of dietary fiber in IBS. Gut. 2014;63(6):889–902.
54. Institute of Medicine, Dietary Reference Intakes for Energy, Carbohydrates, Fiber, Fat, Protein, and Amino Acids. National Academies Press. 2005.
55. McRorie JW. Evidence-based perspective on dietary fiber supplements and clinically important health outcomes. J Am Assoc Nurse Pract. 2015;27(4):217–27.
56. Slavin JL. Dietary fiber and weight management. Nutrition. 2005;21(3):411–8.
57. Stookey JD, Constant F, Popkin BM, Gardner CD. Drinking water is associated with weight loss in overweight dieting women. Obesity. 2008;16(11):2481–8.
58. Vuksan V, Jenkins DJ, Spadafora P, et al. Konjac-mannan and psyllium improve glycemic and lipid responses in type 2 diabetes. Am J Clin Nutr. 1999;70(3):466–71.
59. Rossi M, Johnson DW, Campbell KL. Dietary fiber in chronic kidney disease. Front Med. 2021; 8:591297.
60. Sonnenburg JL, Backhed F. Diet-microbiota interactions as moderators of human metabolism. Nature. 2016;535(7610):56–64.
61. Zeevi D, Korem T, Zmora N, et al. Personalized nutrition by prediction of glycemic responses. Cell. 2015;163(5):1079–94.
62. Cani PD, Van Hul M, Lefort C, et al. Microbial regulation of immunity and inflammation: impact on metabolic disorders. Cell Metab. 2019;30(3):493–506.
63. Tiwari U, Cummins E. Meta-analysis of the effect of dietary fiber on cholestrol levels. Eur J Clin Nutr. 2011;66(3):329–39.
64. Weaver CM, Marr ET. Impact of dietary fiber on nutrient absorption. Adv Nutr. 2013;4(2):191–8.

