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## **Irritable bowel syndrome - pathophysiology, diagnosis, treatment. The role of low FODMAP diet**

Ilona Gąbka<sup>1</sup>, Weronika Dalmata<sup>1</sup>, Jan Dąbrowski<sup>1</sup>, Julita Szarpak<sup>1</sup>, Marta Lipiec<sup>2</sup>

1. Student Scientific Circle at the Department of Epidemiology and Clinical Research Methodology of the Medical University of Lublin.
2. Student Research Group at the independent Laboratory of Functional Disorders of the Chewing Organ, Medical University of Lublin.

### **Abstract**

**Introduction:** The gut microbiota is the microorganisms in the digestive tract. They are mainly bacteria. They play a very important role in maintaining the body's homeostasis. The state of the microbiota is influenced by lifestyle including diet, stress and physical activity. In irritable bowel syndrome, there are disorders in the composition of the intestinal microbiota. It is also associated with a disruption in the proper functioning of the gut-brain axis.

**Aim:** The aim of this study was to review the literature reports on irritable bowel syndrome and the impact of a low FODMAP diet.

**Methods:** Data for the article were retrieved using PubMed setting the time descriptors to 2017-2021.

**Results and conclusions:** Irritable bowel syndrome (IBS) is a chronic functional gastrointestinal disease. It is manifested by chronic abdominal pain, diarrhea or constipation and changes in the frequency of bowel movements. It significantly affects the quality of life

of patients. The diagnosis uses the Roman IV criteria. Pharmacological as well as non-pharmacological methods are important in the treatment. A low-FODMAP diet plays a major role. Studies show that its proper use significantly alleviates the symptoms of IBS.

**Keywords:** irritable bowel syndrome, gut microbiota, FODMAP, low-FODMAP diet

## INTRODUCTION

Human intestinal microbiota are microorganisms found in the gastrointestinal tract. They are mainly bacteria, but also archaeons, fungi viruses, protists [1,2]. The largest number of them is found in the colon, primarily Firmicutes Bacteroidetes, Proteobacteria. In contrast, the stomach is dominated by Actinobacteria and Firmicutes, Bacteroidetes, and Proteobacteria [1,2]. The state of the microbiota depends on many genetic, psychological, physiological as well as environmental factors. Its composition is influenced by the mode of delivery and the type of diet of the newborn. With age, the microbiota develops reaching a symbiosis with the organism [1]. Despite its fairly high stability, the microbiome can change very quickly. Due to the type of diet, past infection or antibiotics [1,3]. The gut microbiome plays very important roles in the body, among others:

1. Allows absorption of nutrients;
2. Produces vitamins;
3. Builds a protective biofilm;
4. Protects against the development of cancer;
5. Influences the proper functioning of the brain [1,2,3].

The brain-intestinal axis connects the central nervous system (CUN) to the gastrointestinal tract and the glands - pancreas and liver. This is mediated by the enteric nervous system (ENS), vagus nerve, hormonal and immune pathways [4]. This communication is bidirectional, with the brain influencing gastrointestinal function, while the condition of the gastrointestinal tract influences brain function. The microbiome influences neurons through vitamins, neurotransmitters and microbial metabolites [15].

Microorganisms synthesize and release neurotransmitters, i.e. such as gamma-aminobutyric acid (GABA), norepinephrine, serotonin, dopamine and acetylcholine. They influence the brain through local effects on the enteric nervous system. It is important to maintain a healthy

gut microbiota to maintain homeostasis. Abnormal communication between the gut and the brain occurs in irritable bowel syndrome (IBS), among other conditions [1].

Aim: The aim of this study was to review the literature reports on irritable bowel syndrome and the impact of a low FODMAP diet.

Methods: Data for the article were retrieved using PubMed setting the time descriptors to 2017-2022.

## IRRITABLE BOWEL SYNDROME

Irritable bowel syndrome is a chronic, functional disease of the gastrointestinal tract [5]. It significantly affects patients' quality of life. The patient's history plays an important role in the diagnosis. It should include medical, surgical, psychological history, lifestyle and medications taken. Attention should be paid to so-called "red flags" that indicate a serious systemic disease. These include sudden unplanned weight loss, anemia, hematochezia, a positive family history of colon cancer or inflammatory bowel disease. The diagnosis of IBS also involves a physical examination and the use of the Rome IV criteria.

Rome Criteria IV:

- I. Symptoms of recurrent abdominal pain at least 1 day a week in the past 3 months;
- II. First symptoms occur at least 6 months before diagnosis;
- III. Pain is associated with at least two of the 3:
  1. With a bowel movement
  2. With a change in the frequency of bowel movements
  3. With a change in consistency [5,6,7,8].

There are 4 subtypes of IBS:

1. IBS - C – predominant constipation;
2. IBS - D – predominant diarrhea;
3. IBS – M – mixed;
4. IBS -U- unclassified [6,8].

The Bristol scale (stool formation scale) is used to classify patients into the appropriate type. It accounts for the type of stool formation [6,8].

Type 1: Separate clumped lumps, difficult to expel;

Type 2: Elongated shape, lumpy;

Type 3: Stool elongated with cracks;

Type 4: Slender, serpentine pieces, smooth and soft;

Type 5: Soft blobs, clear edges;

Type 6: Fluffy pieces with frayed edges;

Type 7: Watery, completely liquid.

The interpretation of the scale is as follows: type 1-2 associated with constipation, 3 and 4 normal, 5 to some extent, and 6,7 associated with diarrhea [8].

It is very important to use the Bristol scale to classify to a specific subtype. In order to implement appropriate treatment.

The first symptoms of the disease usually appear in early adulthood [6]. It affects 9-23% of the general population, including 80% of women [7,8]. The highest incidence is in South America [7]. 28% of referrals to gastroenterologists are patients suffering from IBS [16].

The most common symptoms are chronic recurrent abdominal pain, discomfort, change in bowel frequency, bloating, diarrhea or constipation. In addition, there is lethargy, headaches and mood disturbances [5,7,9].

The pathophysiology of the disease is not fully known. It is complex, influenced by the external as well as internal environment of the body [7]. Genes, diet, intestinal microbiota play a major role. Food intolerances, antibiotics, intestinal infections, psychosocial stressors, visceral hypersensitivity, altered pain perception and brain-gut interaction are also important [7,16].

## MICROBIOTA IN IBS

The intestinal microflora, disturbances in its composition (dysbiosis) and the cerebral-intestinal axis probably play an important role in the pathogenesis [9].

The microbiota in IBS patients differs from that in healthy individuals. Lactobacillus, Bifidobacterium, Faecalibacterium prausnitzii are reduced in IBS patients [5]. In addition, the composition of the microbiota varies depending on the type of IBS. Bacteria of the genus Methanobacteriales are more abundant in IBS - C, while there are fewer in IBS - D compared to healthy individuals [16].

The main role of the microbiota in the pathogenesis of IBS is to influence the immune system, gastrointestinal tract, mucosal permeability, intestinal motility, visceral sensation and gut-brain communication [5]. More and more studies confirm the influence of the gut microbiota on gastrointestinal symptoms, but also on psychiatric disorders in IBS patients [16]. In patients with IBS, effective therapy can be based on the gut microbiota. Mainly prebiotics and probiotics are used, unfortunately, more research is needed to find the golden mean for patients [5].

## TREATMENT

When starting therapy, the severity of symptoms and their impact on quality of life should be determined. A mild course of IBS is worth treating with lifestyle modification. It should consist of the introduction of an appropriate diet, as well as regular physical activity. This helps reduce painful symptoms. Treatment also depends on the type of IBS [7, 10]. In the IBS-C subtype, laxatives, including polyethylene glycol, are helpful. In cases of low efficacy, lubiprostone or linaclotide can be used [6]. In the IBS-D subtype, loperamide and cholestyramine are used to reduce loose stools. In severe cases, serotonin receptor antagonists are well used. Symptomatic treatment is based on the use of: antispasmodics: dicyclomine and hyoscine. Considerable relief is provided by peppermint oil, but it can cause heartburn. Tricyclic antidepressants significantly relieve symptoms also pain and diarrheal symptoms [6, 10].

## DIET

In IBS sufferers, diet plays a key role, both in pathophysiology and therapy [16]. Nearly 70% of patients associate the increase in symptoms with the type of food consumed [11].

Studies have shown that increased symptoms in IBS follow the consumption of milk and milk products, wheat products, hot spices, as well as cabbage and peas. Caffeine consumption has no effect on IBS symptoms. Alcohol abuse leads to the triggering of IBS symptoms. In contrast, moderate alcohol consumption is not associated with IBS symptoms [12, 16].

Hot spices such as chili can cause abdominal pain due to the presence of capsaicin. It acts through the TRPV receptor. However, studies have shown that abdominal pain occurs only with occasional consumption of chili. In contrast, regular consumption can reduce pain and bloating [13, 16].

## FODMAP

Clinical studies have shown that a diet containing very small amounts of FODMAP reduces IBS symptoms. [6]. FODMAPs are fermentable oligosaccharides, disaccharides and monosaccharides, and polyols. These carbohydrates are fermented in the colon due to the fact that they are not fully absorbed in the small intestine. They increase the motility of the gastrointestinal tract, there is a shortening of the passage in the small intestine, and this in turn reduces absorption. Such unabsorbed substances increase intestinal volume due to their high osmotic activity. FODMAPs cause the production of gases, i.e. hydrogen, carbon dioxide and methane, which increases bloating [17]. Foods rich in FODMAPs are: milk and dairy products, sweeteners i.e. mannitol, xylitol. Vegetables ie: onions, garlic, red beans, cabbage, beets, cauliflower. Also fruits i.e.: apple, pear, peach, watermelon and fruit juices [16].

The low FODMAP diet is therapeutic for people with IBS. It is worth emphasizing that this is not a diet for life. What is important is appropriate dietary advice tailored to the patient's needs. It is based on three stages . The first is the elimination of products with high amounts of FODMAP. In the second stage, products with more FODMAP are gradually added to the diet. The last stage involves getting a diet with exclusion of aggravating products. The first stage should last from 4-6 weeks, and this period should not be exceeded due to the sizable restrictions in the diet [13, 14]. This carries the risk of nutritional deficiencies including vitamins, fiber or minerals. In addition, too long a period of elimination can lead to deterioration of the gut microbiota [14].

Products used in this diet include fish, chicken, turkey, eggs. Vegetables i.e. red peppers, potatoes, cucumber, carrots or eggplant. Among fruits, the best will be: bananas, berries, cranberries, grapes and citrus. In addition, you can eat brown rice, oats and oat bran, quinoa, corn and tofu [6].

According to studies, a low FODMAP diet significantly improves the comfort of IBS patients. It reduces general symptoms, abdominal discomfort, diarrhea and bloating [11]. It is more effective than usual dietary therapy in IBS [12].

## SUMMARY

Irritable bowel syndrome is an increasingly common functional gastrointestinal disease. Its course is influenced by many factors. Mainly the state of the intestinal microbiome, which is influenced by lifestyle. Important in diagnosis is the use of the Rome IV criteria and the

division of IBS into subtypes. This enables the selection of appropriate therapy. The use of a low FODMAP diet is effective in the treatment of IBS. The cooperation of the patient with the dietitian is very important. Proper teaching and monitoring of the effectiveness of the diet [1,4,8,12].

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