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Implementation of low FODMAP-based dietary therapy combined with zero waste principles in the management of IBS – case study

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ABSTRACT

Introduction: Irritable Bowel Syndrome (IBS) is a chronic functional gastrointestinal disorder characterized by abdominal pain, bloating, and altered bowel habits. The low FODMAP diet (Fermentable oligosaccharides, disaccharides, monosaccharides and polyols) is one of the most documented dietary interventions in IBS, though its application may be limited by psychological and economic factors.

Objectives: To evaluate the effectiveness of a personalized nutritional intervention based on the low FODMAP diet, considering both patient-centered needs and food waste reduction.

Material and Methods: A 26-year-old female patient with IBS diagnosed according to Rome IV criteria was studied using a longitudinal single-case study with pre-post intervention assessment. Symptoms were assessed with the Gastrointestinal Symptom Rating Scale (GSRS), dietary-health interviews, and body composition measurements by bioelectrical impedance. The intervention lasted seven months and followed three phases of the low FODMAP protocol, incorporating psychological support and the zero-waste concept.

Results: A clinically relevant improvement was observed, with gastrointestinal symptoms reduced and quality of life enhanced. The mean GSRS score decreased from 6.0 to 1.9 points on a scale ranging from 1 (no symptoms) to 7 (severe symptoms). Although statistical analysis was not applicable due to the single-case design, the observed change (average reduction of 4.1 points, corresponding to a 68.3% decrease) suggests clinical relevance. The main methodological limitation of this report lies in its single-case nature, which limits the generalizability of the findings; therefore, further studies with larger sample sizes are needed to confirm these results.

Discussion: Evidence from meta-analyses and randomized trials supports the low FODMAP diet in reducing IBS symptoms. At the same time, this dietary approach requires individualization and professional supervision, as it may limit dietary diversity and contribute to psychological burden.

Conclusions: Personalized dietary therapy based on low FODMAP principles may be effective in managing IBS, particularly when combined with nutritional education and an eco-friendly approach. The results are consistent with current literature supporting the efficacy of the low FODMAP diet in reducing IBS symptoms. An additional advantage of this intervention was integrating the zero-waste principle, which may have positively impacted both the patient's economic situation and nutritional awareness.

KEYWORDS

Gastrointestinal symptoms, Nutritional counseling, Personalized nutrition; Food sustainability.

ABBREVIATIONS

BMI: Body Mass Index.

FODMAP: Fermentable oligosaccharides, disaccharides, monosaccharides and polyols.

GSRS: Gastrointestinal Symptom Rating Scale.

IBS: Irritable Bowel Syndrome.

IBS-QoL: Irritable Bowel Syndrome Quality of Life.

IBS-SSS: Irritable Bowel Syndrome Symptom Severity Score.

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INTRODUCTION

Irritable Bowel Syndrome (IBS) is a chronic intestinal disorder characterized by abdominal pain or discomfort. It is associated with changes in bowel frequency and/or stool consistency. These changes are not caused by organic or biochemical disorders. Additional symptoms may include urgency, bloating, a sensation of incomplete evacuation, heartburn, nausea, vomiting, menstrual disturbances, frequent urination, or psychological disorders. IBS is diagnosed based on the Rome IV criteria[1,2]. The exact cause of IBS is unknown. Functional gastrointestinal disorders may result from, among other factors, visceral hypersensitivity to pain, disturbances in the gut–brain axis, impaired intestinal motility and transit, inappropriate diet and lifestyle, prior infection, genetic factors, alterations in gut microbiota, mental health dysfunctions, and psychosocial factors[2-4]. Globally, approximately 3.8% of individuals are affected by IBS according to the Rome IV criteria, and 10% according to the Rome III criteria[2]. The foundation of IBS management includes diet, lifestyle modification, and normalization of stress-related factors and responses[2]. The most commonly applied dietary therapy in clinical practice is the low FODMAP diet (Fermentable oligosaccharides, disaccharides, monosaccharides, and polyols). This diet is based on eliminating or restricting carbohydrates that may exacerbate IBS symptoms. It was developed by researchers at Monash University in Australia between 2004 and 2010[2,5]. The low FODMAP diet is an elimination diet and therefore has application limitations. It should not be implemented in individuals with diagnosed eating disorders, children, undernourished individuals or those at risk of malnutrition, highly selective eaters, or individuals following other elimination diets. In such cases, a mild version of the diet, excluding only certain FODMAP-containing products, or an individualized dietary therapy tailored to the patient, may be considered[2]. The diet also has economic limitations. Strict portioning based on the Monash app[6] or recommended and non-recommended food tables may lead to unused food, which eventually spoils and must be discarded. Food waste is a major global issue, with about one-third of food produced worldwide not being consumed[7]. In 2015, as an EU member, Poland implemented a sustainable development strategy based on Agenda 2030, which includes 17 Sustainable Development Goals. Goal 12 is to "Ensure sustainable consumption and production patterns"[8], including halving food waste. Zero-waste strategies, which aim to minimize waste to the absolute minimum[9], are a growing trend in society. In summary, the standard low FODMAP diet may conflict with sustainable development and zero-waste principles and can impose psychological burdens on stress-prone patients, such as those with IBS. Over 70% of IBS patients experience anxiety or depression[1]. These factors should be considered when implementing the diet, with modifications aimed at making it more patient- and environmentally friendly. This study presents a case of a Polish female IBS patient for whom the standard low FODMAP diet was not feasible due to the patient's individual characteristics and psychodietary limitations. The diet was modified to suit the patient's needs and capabilities. The article highlights the importance of individualized patient care and tailored dietary recommendations, particularly for psychologically burdened patients.

OBJECTIVES

To conduct a nutritional intervention based on the low FODMAP diet, taking into account an individualized, patient-centered approach, and to analyze the effectiveness of the implemented dietary therapy.

MATERIALS AND METHODS

This study employed a single-case longitudinal design with pre–post symptom evaluation, focusing on the analysis of a patient with IBS. A non-probabilistic, purposive sampling method was used, meaning the patient was selected due to specific clinical and diagnostic characteristics that illustrate the problem under investigation[10]. The participant was a 26-year-old female diagnosed with irritable bowel syndrome according to the Rome IV criteria. A gastroenterologist recommended the low FODMAP diet. An additional goal for the patient was body weight reduction. Before implementing the full low FODMAP dietary intervention, a dietary and health interview was conducted. The patient reported a history of eating disorders, currently treated depression, and severe anxiety toward consuming certain food groups/products. She also requested that a zero-waste strategy be incorporated into her meal plan and dietary recommendations. Based on the information obtained, the classical low FODMAP diet was modified, introducing a dietary therapy based on low FODMAP principles combined with food waste reduction. Body composition was measured using bioelectrical impedance analysis (Tanita WB-150 MA, Tanita Corporation, Tokyo, Japan). The device was calibrated according to the manufacturer's instructions before each session. All measurements were performed in the morning, with the patient in a fasted state and after voiding, to ensure consistency in hydration and body fluid status. Symptoms were assessed using 11 questions from the Gastrointestinal Symptom Rating Scale (GSRS) on a scale ranging from 1 (no symptoms) to 7 (severe symptoms). The main symptoms included abdominal pain, bloating, and constipation, which were exacerbated under stress. The intervention lasted seven months, from July 2024 to February 2025, and comprised three dietary phases: Phase 1 – elimination, Phase 2 – reintroduction, and Phase 3 – stabilization, following the low FODMAP protocol. Phase 1 involved excluding high-FODMAP foods for three weeks. Quantities were adjusted to Polish market availability to minimize waste, ensuring adherence to the zero-waste principle. After this period, symptoms were evaluated using the GSRS questionnaire. If improvement was observed (reduction to 5 or less in at least half of the questions), the patient proceeded to Phase 2; otherwise, Phase 1 continued for another three weeks. If no improvement occurred after six weeks, an alternative intervention, such as a low-residue diet, would have been

considered. Phase 2 involved gradual reintroduction of excluded foods, based on patient tolerance. Foods causing minimal gastrointestinal discomfort and anxiety were reintroduced first, in small portions (¼ to ½ of typical intake), with gradual increase in the following month depending on symptom occurrence. If symptoms appeared, the product was excluded and reintroduced after a one-month break. This approach aimed to reduce patient stress from constant portion calculations and minimize food waste. Phase 2 lasted four months. Phase 3 consisted of stabilization with a personalized Mediterranean-style diet, excluding intolerant foods, for two months. Throughout the intervention, the patient maintained continuous contact with a dietitian and received educational materials, including monitoring tasks, leaflets, and a patient guide. A total of nine visits were conducted during the intervention. The dietary intervention process comprised seven components, as shown in Figure 1.

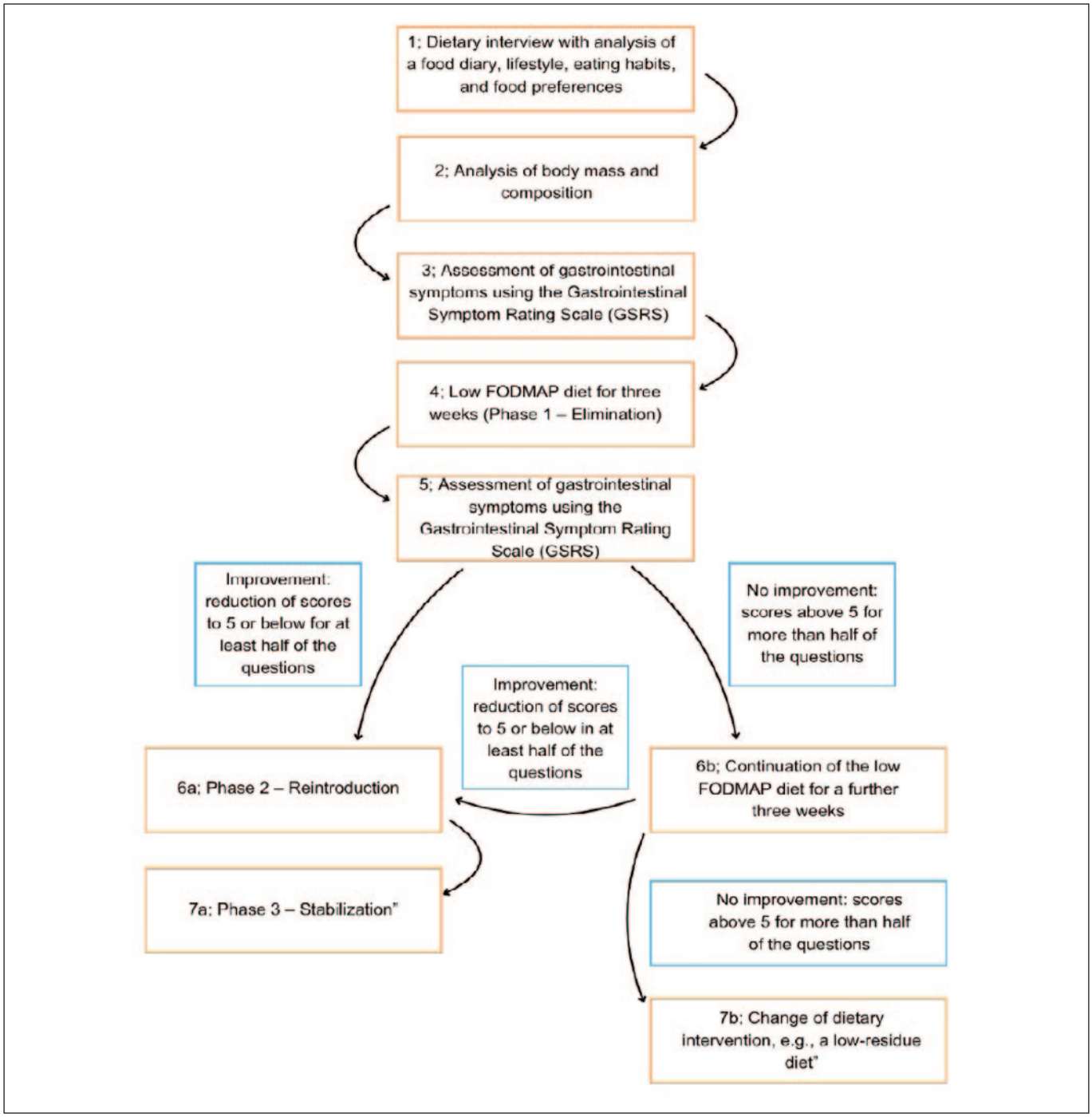

Figure 1. Simplified study design (authors' own elaboration)

Ethical approval for this study was obtained from the Rector's Committee on Research Ethics of the Wrocław University of Environmental and Life Sciences (Resolution No. 14/2023, dated June 29, 2023). Written informed consent was obtained from the patient for participation and publication of the case details.

RESULTS

The implementation of dietary therapy based on low FODMAP principles, complemented by elements of the zero-waste concept, proved effective in reducing IBS symptoms in the patient. Figure 2 presents a comparison of the GSRS questionnaire results from the initial and follow-up visits after completing the first dietary phase, the elimination phase.

A marked reduction in gastrointestinal symptoms and an improvement in the patient's quality of life were observed. The mean GSRS score decreased from 6.0 to 1.9 points on a scale ranging from 1 (no symptoms) to 7 (severe symptoms), representing an average improvement of 4.1 points, corresponding overall reduction of 68.3% in GSRS mean score. Due to the single-case design, statistical significance was not assessed; however, a clinically relevant improvement was observed. A score of 5 or below in more than half of the GSRS items was used as the cut-off point (as shown in Figure 1), suggesting clinically relevant improvement. As illustrated in the Figure 2, 10 out of 11 questionnaire items (representing 90.9% of the questions), scores decreased to 5 or below, allowing the patient to progress to the next phase, the reintroduction phase. The only exception was question 9, regarding increased bowel frequency in the past week, which worsened from 1 to 3. The patient explained that this was due to consuming lactose-containing Skyr yogurt instead of the lactose-free version, which triggered diarrhea. Once replaced with a lactose-free product, symptoms resolved, and the patient adjusted her response back to 1. Modifications applied in this phase are presented in Table 1.

Portion sizes were increased by an average of approximately 29.8% relative to the amounts allowed according to the Monash app. Minor adjustments in food portions were sufficient to yield measurable benefits in terms of dietary therapy effectiveness, environmental impact, and psychosocial well-being (patient's mental health). The modified reintroduction phase produced favorable outcomes. Food groups/products were gradually added according to the patient's psychological and physiological tolerance and the zero-waste principle. Analysis of the results indicated that most newly introduced foods were well tolerated, allowing for a significant expansion of the diet while maintaining symptom reduction. Reintroduction also enabled identification of symptom-triggering foods; in this patient, lactose-containing products caused symptoms. Their elimination, combined with expansion of other dietary components, positively affected dietary variety and the patient's quality of

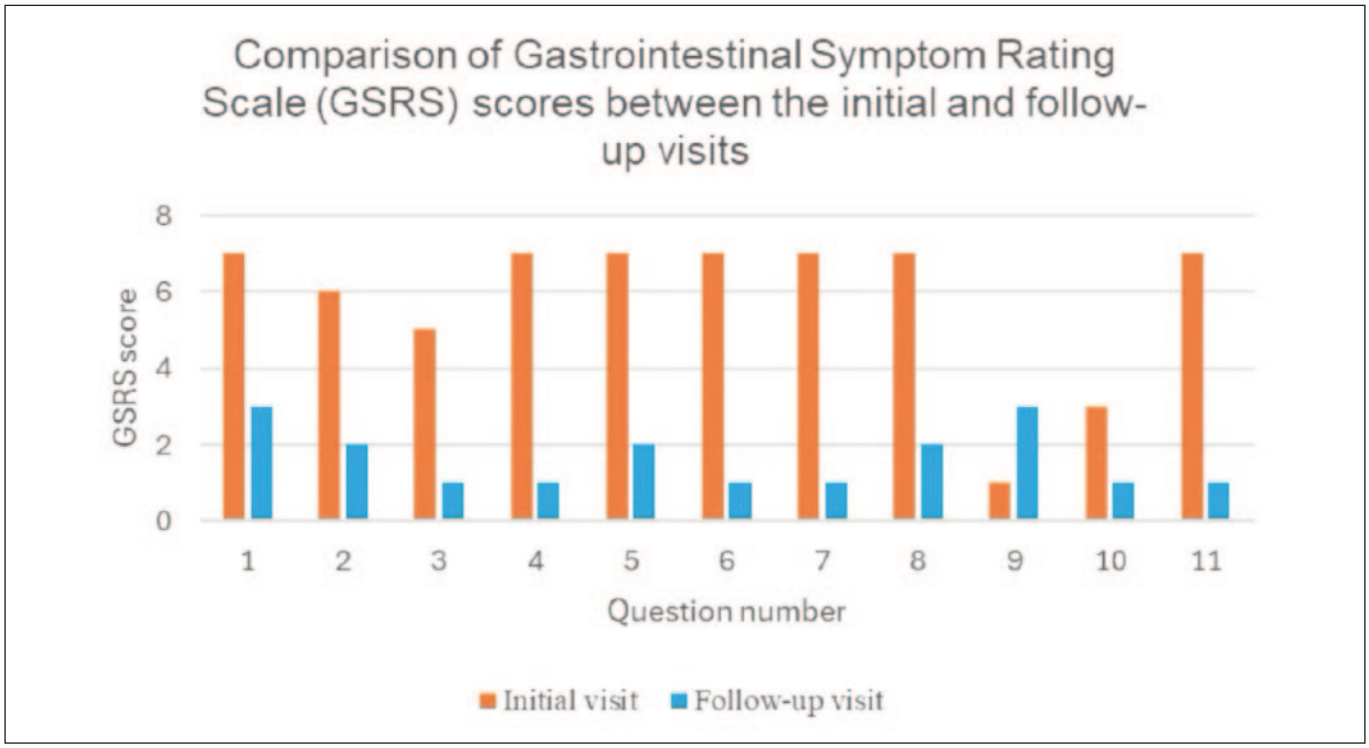

Figure 2. Comparison of Gastrointestinal Symptom Rating Scale (GSRS) scores between the initial and follow-up visits

Table 1. Modifications of FODMAP product quantities in the patient's diet (own elaboration and based on data from the Monash app[7])

Product	Amount allowed according to the Monash app[7] (g)	Amount used in the diet according to the zero-waste trend (g)*	Household measure of the amount used in the diet according to the zero-waste strategy
Zucchini	67	100	1/4 piece
Banana	95	100	1/2 piece
Mozzarella cheese	40	60	1/2 piece
Feta cheese	40	50	1/4 piece
Halloumi cheese	40	50	1/4 piece
Oyster mushrooms	75	90	1/4 package
Sunflower seeds	6	10	1 tablespoon
100% fruit jam	14	20	2 tablespoons
Bread	73	60-90	2-3 slices
Cherry tomatoes	45	50	half a handful

*Modifications were validated by a clinical dietitian to maintain nutritional adequacy.

life. During the third phase (stabilization), a personalized Mediterranean-style diet with restriction of symptom-triggering foods was established. The diet was balanced, varied, and tailored to the patient's preferences, while maintaining gastrointestinal symptom reduction. Incorporation of zero-waste principles further enhanced the economic and psychodietary aspects of the intervention. It can be inferred that certain restricted foods have a greater impact on IBS symptoms than others. Safely increased foods included cheeses, whole-grain bread, and some vegetables such as zucchini and bell peppers. Likely symptom-inducing foods included stone fruits, lactose-containing products, white bread, onion, garlic, and legumes. These findings are consistent with the application of a mild low FODMAP diet[2]. An additional important aspect for the patient was body weight reduction. Despite an initially normal BMI, weight loss contributed to improved well-being and greater body acceptance. Body composition was assessed using bioelectrical impedance analysis (Tanita WB-150 MA, Tanita Corporation, Tokyo, Japan). The device was calibrated according to the manufacturer's instructions, and all measurements were performed in the morning, after fasting, and after urination. Table 2 summarizes changes in body weight and composition during the dietary intervention.

Following the intervention, the patient lost 5.5 kg. Body fat decreased by 3.3%, while lean body mass remained unchanged, which is favorable in terms of preventing loss of muscle mass during weight reduction. BMI decreased by 2.7 kg/m².

Table 2. Comparison of body composition and weight between visit 1 and visit 9

Parameter	Value from visit 1	Value from visit 9
Body weight (kg)	63,5	58
Body fat percentage (%)	28,8	25,5
Lean body mass (kg)	42	42
BMI (kg/m^2)	23	20,3

BMI - Body Mass Index.

DISCUSSION

Eating habits influence the development of irritable bowel syndrome (IBS) as well as other associated diseases[11].The low FODMAP diet is becoming a standard in clinical practice for the management of irritable bowel syndrome (IBS), although clear guidelines regarding its implementation are still lacking[12]. Nevertheless, numerous studies indicate its high effectiveness in reducing gastrointestinal symptoms. A meta-analysis[13] including five randomized controlled trials, as well as non-randomized and prospective studies, demonstrated a statistically significant reduction in IBS symptom severity in patients following a low FODMAP diet. The average improvement was 51,5 points on the Irritable Bowel Syndrome Symptom Severity Score (IBS-SSS). Similar results were confirmed by an

analysis[14] of 772 patients. Using the Irritable Bowel Syndrome Quality of Life (IBS-QoL) questionnaire, improvements in quality of life were observed, alongside a 45-point reduction in IBS-SSS scores. The authors noted, however, a potential decrease in Bifidobacterium abundance, highlighting the need to monitor the duration of the diet and to implement it under dietitian supervision.

Recent randomized studies[15,16] confirm that the low FODMAP diet significantly reduces IBS symptom severity in the short term, normalizes stool consistency, and improves patients' quality of life. Some studies also showed that patients with initially more severe symptoms respond better to the intervention. Other research[17,18] confirmed the diet's effectiveness in both adolescent and adult populations, emphasizing the necessity of individualized recommendations and the role of an experienced dietitian.

Interesting observations also come from a case study[19], in which the low FODMAP diet improved not only IBS symptoms but also coexisting migraine, suggesting potential broader applications of this dietary intervention.

It should be noted, however, that elimination diets can lead to reduced dietary variety and negatively affect the patient's relationship with food[20]. Therefore, the low FODMAP diet should be implemented in a personalized manner, with a reintroduction phase and modifications tailored to the patient's needs, alongside dietary and psychological support.

CONCLUSIONS

The implementation of personalized dietary therapy based on low FODMAP principles appeared to be effective in reducing clinical symptoms in the patient described in this case study. Success was not only dependent on adherence to the elimination–reintroduction dietary protocol but also on concurrent nutritional education, which enhanced the patient's awareness and facilitated a better understanding of the relationship between consumed foods and experienced symptoms. An important complement to the therapeutic process was the incorporation of an eco-friendly approach based on the zero-waste principle. This strategy helped minimize food waste and strengthened the patient's sense of control over the dietary intervention. Such an approach may represent a valuable added component in clinical practice, particularly in the context of long-term adherence to dietary recommendations. This case demonstrates that individualized recommendations, dietetic supervision, and the inclusion of educational and eco-friendly elements can increase the effectiveness of dietary interventions and support sustainable changes in eating habits, especially in patients with psychodietary burdens. Further research involving larger and more diverse patient groups is warranted to confirm these promising results and to evaluate the long-term effectiveness and sustainability of such individualized, eco-conscious dietary interventions.

REFERENCES

1. Gajewski P, editor. Interna Szczeklika. 10th ed. Kraków: Medycyna Praktyczna; 2019.
2. Stróżyk M. Dietoterapia zespołu jelita drażliwego. Warszawa: PZWL; 2023. doi:10.53271/2023.070
3. Altobelli E, Del Negro V, Angeletti PM, Latella G. Low-FODMAP diet improves irritable bowel syndrome symptoms: a meta-analysis. Nutrients. 2017: 26;9(9):940. doi: 10.3390/nu9090940
4. Morales Carreño D, Araya Varas D, Morales Ríos S, Massone Bustamante M, Gallego López D, Astudillo Ganora I. Relación entre el estrés percibido, el síndrome de intestino irritable y las características de las deposiciones en estudiantes universitarios chilenos. Nutr Clín Diet Hosp. 2025;45(3):416-421. doi:10.12873/453astudillo.
5. Monash University. Research at Monash University. [Internet]. Available from: https://www.monashfodmap.com/about-fodmap-and-ibs/ [cited 2024 Jul 20].
6. Monash University. Monash FODMAP Diet App [Internet]. Available from: https://apps.apple.com/pl/app/monash-fodmap-diet/id586149216?l=pl [cited 2024 Jul 20].
7. Zborowski M, Mikulec A, Wygoda M, Wojtas Z, Magiera A, Kruczek K. Straty i marnowanie żywności - charakterystyka problemu oraz sposoby przeciwdziałania skali zjawiska. Innowacje w Pielęgniarstwie i Naukach o Zdrowiu [online]. 2024 Dec 30: 9(4), 107-113. Available from: https://apcz.umk.pl/IWPNZ/article/view/58508 [cited 2024 Nov 25]. doi:10.21784/IwP.2024.024
8. Kampania 17 Celów. Cel 12: Odpowiedzialna konsumpcja i produkcja [Internet]. Available from: https://kampania17celow.pl/cel-12-odpowiedzialna-konsumpcja-i-produkcja/ [cited 2024 Jul 30].
9. Pietzsch N, Ribeiro JLD, de Medeiros JF. Benefits, challenges and critical factors of success for Zero Waste: a systematic literature review. Waste Manag. 2017;67:324-353. doi:10.1016/j.wasman.2017.05.004
10. Bajana S, Beltrán T, Peñafiel D. Educación nutricional durante la alimentación enteral en domicilio de un caso con Síndrome de Wolf Hirschhorn en Ecuador. Nutr Clín Diet Hosp. 2020;40(2):181-187. doi:10.12873/402bajana
11. Fuentes-Gómez A, Rendo-Urteaga T. Hábitos alimentarios, síntomas y enfermedades subyacentes asociadas a sobrecrecimiento bacteriano intestinal (SIBO): Un estudio transversal en consulta privada en Bizkaia. Nutr Clín Diet Hosp. 2025;45(2):94-103. doi:10.12873/452fuentes
12. Pietrzak A, Skrzydło-Radomańska B, Mulak A, Lipiński M, Małecka-Panas E, Reguła J, et al. Rekomendacje diagnostyczno-terapeutyczne w zespole jelita nadwrażliwego. Gastroenterology Rev. 2018;13(4):167-96. doi:10.5114/pg.2018.78343
13. Varjú P, Farkas N, Hegyi P, Garami A, Szabó I, Illés A, et al. Low fermentable oligosaccharides, disaccharides, monosaccharides and polyols (FODMAP) diet improves symptoms in adults suffering from irritable bowel syndrome (IBS) compared to standard IBS diet: A meta-analysis of clinical studies. PLoS One. 2017; 9(3):289. doi: 10.1371/journal.pone.0182942

14. van Lanen AS, de Bree A, Greyling A. Efficacy of a low-FODMAP diet in adult irritable bowel syndrome: a systematic review and meta-analysis. Eur J Nutr. Sep 2021; 60(6):3505-3522. doi: 10.1007/s00394-020-02473-0

15. Algera JP, Demir D, Törnblom H, Nybacka S, Simrén M, Störsrud S. Low FODMAP diet reduces gastrointestinal symptoms in irritable bowel syndrome and clinical response could be predicted by symptom severity: a randomized crossover trial. Clin Nutr. 2022 Dec; 41(12):2792-2800. doi:10.1016/j.clnu.2022.11.001

16. Van den Houte K, Colomier E, Routhiaux K, Mariën Z, Schol J, Van den Bergh J, et al. Efficacy and findings of a blinded randomized reintroduction phase for the low FODMAP diet in irritable bowel syndrome. Gastroenterology. 2024 Jul;167(2):333-342. doi:10.1053/j.gastro.2024.02.008

17. Zahedi MJ, Behrouz V, Azimi M. Low fermentable oligo-di-monosac charides and polyols diet versus general dietary advice in patients with diarrhea predominant irritable bowel syndrome: A randomized controlled trial. J Gastroenterol Hepatol. 2018 Jun; 33(6):1192-1199. doi: 10.1111/jgh.14051

18. Rexwinkel R, Vermeijden NK, Zeevenhooven J, Kelder J, Groeneweg M, Hummel T, et al. The low FODMAP diet in adolescents with functional abdominal symptoms in a non-guided setting: a prospective multicenter cohort study. Eur J Pediatr. 2025 Feb 11;184(2):189. doi:10.1007/s00431-025-05999-9

19. Bonakdar RA, Sweeney MM, Garvey C, White AA, VanNoord MU. Case report: initial successful treatment of migraine and irritable bowel syndrome with a low-FODMAP diet. J Am Nutr Assoc. 2024 May-Jun;43(4):339-344. doi: 10.1080/27697061.2023.2288081

20. Nybacka S, Kinnander A, Augustin H, Bärebring L. Perceived healthiness of foods, food avoidance and diet-related anxiety in individuals with self-reported irritable bowel syndrome: a cross-sectional study. BMC Nutr. 2024 Oct 10;10(1):134. doi:10.1186/s40795-024-00945-8