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ORIGINAL ARTICLE

DIET FOR WOMEN WITH IRRITABLE BOWEL SYNDROME – A PRELIMINARY STUDY

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ABSTRACT

Background. Irritable Bowel Syndrome (IBS) is one of the most frequent digestive system diseases, of various medical signs. It is assumed that proper life style, including appropriate, rational diet is a factor helpful for treating such a disorder.
Objective. The purpose of this paper was to assess the selected dietary habits, and to evaluate the nutritional value of daily food rations for patients with a mixed type of Irritable Bowel Syndrome.
Material and Methods. The questionnaire survey involved a group of 32 women suffering from a mixed type of Irritable Bowel Syndrome (The Rome III Diagnostic Criteria were used to diagnose the disease). The control group was comprised of 32 healthy women. The methods used to assess the diet were divided into quantitative and qualitative ones.
Results. The most frequent dietary mistakes among patients with IBS were associated with snacking sweets (83.0% of the subjects) and fruit (17.0% of the subjects) between the meals. A higher intake of sucrose was found amongst women with IBS, than in the case of the control group (p=0.0169). The analysis of the results demonstrated a significantly higher intake of water (derived from drinks and foods) amongst patients with IBS, than in the case of women of the control group (p=0.0267). An insufficient intake of plant proteins and polyunsaturated fatty acids was recorded in both groups. The supply of protein in general, animal protein, fat in general, saturated fatty acids and sodium, exceeded the recommended norm, both amongst women with IBS and women of the control group.
Conclusions. The obtained examination results showed that there are significant dietary improprieties in the diet of women suffering from IBS. In order to eliminate these mistakes in the future, it seems justified to extend the knowledge on rational nutrition amongst patients with IBS.

Key words: *irritable bowel syndrome, dietary habits, daily food rations, diet*

STRESZCZENIE

Wprowadzenie. Zespół jelita nadwrażliwego (IBS – *Irritable Bowel Syndrome*) jest jedną z najczęstszych chorób przewodu pokarmowego o różnym obrazie klinicznym. Przypuszcza się, że prawidłowy styl życia, w tym odpowiednia, racjonalna dieta jest czynnikiem pomocnym w leczeniu tego schorzenia.
Cel. Celem pracy była ocena wybranych zwyczajów żywieniowych oraz ocena wartości odżywczej dziennych racji pokarmowych pacjentek z mieszaną postacią zespołu jelita nadwrażliwego.
Materiał i metody. Badaniami ankietowymi objęto grupę 32 kobiet chorujących na postać mieszaną zespołu jelita nadwrażliwego (do rozpoznania choroby wykorzystano Kryteria Rzymskie III). Grupę kontrolną stanowiły 32 zdrowe kobiety. Metody stosowane dla oceny sposobu żywienia podzielone były na metody ilościowe i jakościowe.
Wyniki. Najczęściej popełnianymi błędami dietetycznymi wśród pacjentek z IBS było dojadanie między posiłkami: słodyczy (83,0% badanych) i owoców (17,0% badanych). Wśród kobiet z IBS stwierdzono wyższe spożycie sacharozy, niż w grupie kontrolnej. Istotnie niższe spożycie błonnika pokarmowego odnotowano wśród pacjentek z IBS niż w grupie kontrolnej (p=0,0169). Analiza uzyskanych wyników wykazała, że pacjentki z IBS istotnie więcej spożywają wody (pochodzącej z napojów i produktów spożywczych) niż kobiety z grupy kontrolnej (p=0,0267). W obu grupach odnotowano niedostateczne spożycie białka roślinnego i wielonienasyconych kwasów tłuszczowych. Podaż białka ogółem, białka zwierzęcego, tłuszczu ogółem, nasyconych kwasów tłuszczowych i sodu, przekraczało zalecaną normę zarówno wśród kobiet z IBS jak i kobiet grupy badanej.
Wnioski. Uzyskane wyniki badań wykazały, że w sposobie żywienia kobiet z IBS istnieją duże nieprawidłowości. Celem eliminacji tych błędów w przyszłości zasadnym wydaje się poszerzenie wiedzy z zakresu racjonalnego żywienia wśród pacjentów z IBS.

Słowa kluczowe: *zespół jelita nadwrażliwego, zwyczaje żywieniowe, dzienne racje pokarmowe, dieta*

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INTRODUCTION

Irritable Bowel Syndrome (IBS) is a frequent digestive system disease. In the European countries and the United States, the percentage of people suffering from this disease is as high as 20,0%, whereas within the Polish population it amounts to ca. 13,0% [31]. Women suffer from the disease twice as often as men, and IBS develops mainly in the third decade of life [31]. When it comes to Irritable Bowel Syndrome, no anatomic alterations, responsible for the condition, were reported. The greatest importance for the development of IBS is attributed to the intestinal motility disorders, visceral hypersensitivity and disorders of the enteric nervous system [23]. The development of the disease may be affected by multiple factors, i.e. past infection of the digestive tract, disturbances in the gut flora, psychosocial and dietary causes, genetic factors and past surgical procedures within the abdominal cavity, or the abuse of antibiotics or laxative and hormonal medicines [31]. The key symptom of the IBS is chronic or recurring pain and/or discomfort in the abdominal cavity, related to the change in defecation rhythm. IBS can be diagnosed upon collecting the detailed medical history, and conducting the subject examination, often without the need for additional, specialist diagnostic tests. What is useful is the document entitled Roman III Criteria, of 2016, which emphasizes the role of the duration and frequency of pain, and the degree of feces formation [23]. Four manifestations of IBS are distinguished: with constipation, with diarrheas, mixed type and undefined type [23]. The purpose of treatment of patients with IBS is to cause regression or significant mitigation of the unpleasant symptoms, which not only cause the conditions but also substantially decrease the comfort of life. In some sufferers, it is possible to achieve many-months or multiannual remissions, i.e. full regression of symptoms (it does not mean full recovery). The diet of a patient with IBS usually depends on individual responses to food products. Although diet is not the cause of this disease, some foods may intensify its symptoms. Therefore, proper diet is an important element of the therapy against this disease, influencing the quality of life of the patients.

The purpose of this paper was to quantitatively assess the daily food rations (DFR), and to evaluate the selected dietary habits of patients with a mixed type of Irritable Bowel Syndrome.

MATERIAL AND METHODS

The questionnaire survey involved 32 women with a diagnosed mixed type of Irritable Bowel Syndrome (on the basis of The Rome III Diagnostic Criteria) [23]. The average age of the subjects was 31.5 ±9.4. Patients were treated at the Gastroenterology Dispensary of the University Hospital in Bialystok, and the Gastroenterology Dispensary of the Independent Public Health Care Institution, Jedrzej Sniadecki Joint Voivodeship Hospital in Bialystok. The study was conducted upon obtaining authorization no. R-I-002/496/2013, of the Bioethics Committee of the Medical University of Bialystok.

The assessment of the nutritional value and the analysis of the dietary habits of women suffering from IBS were conducted during autumn and winter seasons in the years 2015/2016.

The control group was comprised of 32 healthy women from Podlaskie voivodeship, who volunteered to participate in the study. Their average age was 32.9±8.2. Both the test group subjects and the control group subjects understood the aim and the nature of the study, agreed for its conditions and expressed their knowing consent, in writing, prior to their engagement in the study.

The assessment of the nutritional status was carried out on the basis of quantitative specification of the anthropometric features: body mass (kg); body height (cm) waist-hip ratio (WHR) (cm) and waist circumference (measured at the half of the distance between the lower rib cage and the iliac crest); body mass index (BMI) (kg/m^2), ideal body weight (BMI 18.5 – 24.9 kg/m^2), overweight (BMI 25.0 – 24=9.9 kg/m^2), and obesity (BMI ≥30.0 kg/m^2) [14].

In order to evaluate the dietary habits, a survey questionnaire, designed at the Department of Dietetics and Clinical Nutrition, Medical University of Bialystok, was used. The questionnaire included questions concerning the socio-demographic situation of the subjects, and questions concerning the analysis of selected dietary habits: number of the consumed meals, their regularity, snacking between the meals, kinds of the consumed snacks, and eating frequency of selected groups of food products. When it comes to questions concerning the eating frequency of selected food products, the patients had 7 categories to choose from, as follows: from "I don't eat this at all" to "I eat this every day". Suitable ranks were ascribed to each category, as follows; I don't eat this at all – 1; I eat this less often than once a month – 2; I eat this 1-2 times a month – 3; I eat this once a week – 4; I eat this 2 – 3 times a week – 5; I eat this 4 – 6 times a week; I eat this every day – 7. Then, the median of ranks (Me) of the eating frequency of the examined products, and the interquartile range (IQR). The calculations of the arithmetic mean, standard deviation (SD) and percentage, were also used for computation.

The volume of the consumed portions of products and dishes was estimated using cooking weights and measures, and on the basis of the "Album of photographs of food products and dishes" [34]. In order to assess the caloric and nutritional value of daily food rations (DFR), a Diet 5.0 computer program, including the database of the National Food and Nutrition Institute, Warsaw (NFNI) was used, which takes into account the nutrient losses upon culinary

processing. The use of dietary supplements, such as vitamin-mineral preparations, and adding kitchen salt while preparing dishes, were not taken into consideration upon the dietary assessment. The caloric value of an average daily food ration was calculated together with the water content and the following nutrients: protein in general, animal and plant protein, carbohydrates in general, fiber, fats in general, saturated fatty acids (SFAs), monounsaturated fatty acids (MUFAs), polyunsaturated fatty acids (PUFAs), cholesterol, sucrose, lactose and sodium. It was assumed that SFAs, MUFAs, PUFAs should provide 7%; 15%; 8% of the daily caloric requirement, respectively. The energy and nutrient values obtained this way were then referred to the present dietary norms – the norm settled at the level of the Estimated Average Requirement for the group (EAR) or Adequate Intake (AI) for women with low Physical Activity Level (PAL 1.4) [13]. The women being tested were ascribed to the aforementioned group on the basis of the collected information on their living conditions and work [13]. The values amounting to 100±10% of the recommended norm were considered appropriate.

The statistical evaluation of the obtained results was carried out with the use of STATISTICA 12.0 program, of StatSoft company. Upon statistical elaboration of the obtained results, U *Mann Whitney* and χ^2 tests were used, along with t-test for two independent samples with *Yates's* correction for continuity, u-test for two structure indicators, calculating also the r *Pearson's* r correlation, adopting the values for which $p<0.05$ as significant.

RESULTS

The studies involved 64 women (32 people suffering from the mixed type of Irritable Bowel Syndrome and 32 healthy subjects), during the autumn-winter season of the years 2015/2016. The group characteristics was shown in Table 1.

Table 1. Sample characteristics

Charakteristics	IBS patients (n) = 32	Controls (n)=32	p value
Age (years)	31.5±9.4	32.9±8.2	0.5481
Body height (cm)	170.2±8.3	170.1±9.0	0.9289
Body weight (kg)	69.5±15.0	71.3±12.0	0.5956
BMI (kg/m^2)	23.9±3.3	24.5±3.2	0.4575
WHR (waist - hip ratio)	0.8±0.08	0.8±0.05	0.2778
Waist circumference (cm)	84.5±12.9	87.8±10.3	0.2758
Marital status: married unmarried	 20 (62.0%) 12 (38.0%)	 24 (75.0%) 8 (25.0%)	0.4975
Education: primary secondary higher	 1 (3.0%) 11 (34.0%) 20 (63.0%)	 3 (9.0%) 9 (28.0%) 20 (63.0%)	0.2680

Values are given as mean±standard deviation or n (%)

The compared groups did not indicate significant differences in terms of anthropometric and demographic traits. Most subjects were married women with appropriate body mass (average BMI of the test group subjects 23.9±3.3 kg/m^2, control group subjects 24.5±3.2 kg/m^2), having a university degree.

Table 2 presents the number and type of the consumed meals, drinks and products that are most often eaten between the meals. When it comes to the assessment of the selected dietary habits, no differences of statistical importance were noted within the compared groups. It was established that a 4-meal dietary plan was prevailing in both of the examined groups (69.0% of subjects in the group with IBS, 72.0% in the control group). Women with IBS most often included breakfast, dinner and supper in their menus (>75,0% of subjects). Similarly, women of the control group most often consumed breakfast (91.0%), dinner (87.0%) and supper (84.0%). Up to 75.0% subjects with IBS and 81.0% of subjects in the control group declared that they eat snacks between the meals. The food products most often consumed by patients with IBS were sweets – 83.0% and fruit – 17.0% of subjects. Whereas, when it comes to snacking between the meals, patients of the control group most often chose sweets (58.0%), fruit (27.0%) and sandwiches (11.0%).

Table 2. Assessment of chosen eating habits among studied subjects

Studied feature	IBS patients (n=32)	Controls (n=32)	p value
Number of meals: ≤3 ≥4	 10 (31%) 22 (69%)	 9 (28%) 23 (72%)	0.4066
Type of meals: breakfast mid-morning meal lunch afternoon tea dinner additional eating between meals	 24 (75%) 20 (62%) 24 (75%) 10 (31%) 25 (78%) 24 (75%)	 29 (91%) 18 (56%) 28 (87%) 11 (34%) 27 (84%) 26 (81%)	 0.1203 0.5027 0.0878 0.8102 0.9175 0.7072
Type of additional snack: sweets fast food sandwiches fruit	n=24 20 (83%) 0 (0%) 0 (0%) 4 (17%)	n=26 15 (58%) 1 (4%) 3 (11%) 7 (27%)	0.1166

In this paper, the customary intake frequency of selected food products was also evaluated (Table 3).

It was established that the test group patients with IBS consumed corn flakes significantly more often (median – 1-2 times a month, R=2.5), in comparison to women of the control group (no consumption, R=10, p=0.0012).

Table 3. Consumption of food groups in irritable bowel syndrome patients and their controls groups

Food products groups	IBS patients (n=32)	Controls (n=32)	p value
	Me (IQR)	Me (IQR)	Me (IQR)
Groats	4.0 (3.0;4.0)	3.7 (3.0;4.0)	0.8120
Rice	4.0 (3.0;5.0)	4.0 (3.0;4.0)	0.4463
Pasta	4.2 (4.0;5.0)	4.0 (3.0;5.0)	0.3020
Cornflakes	2.5 (1.0;4.5)	1.0 (1.0;2.0)	**0.0012**
Oatmeal	5.0 (3.0;5.0)	3.0 (1.0;4.5)	0.0628
Wheat bread	4.0 (3.0;6.5)	5.0 (4.0;6.0)	0.5662
Rye bread	4.5 (3.0;5.5)	5.0 (3.0;6.0)	0.0650
Sweet bread	3.3 (2.0;5.0)	3.0 (1.0;4.0)	0.4130
Flour dishes (dumplings, omelets)	3.5 (3.0;4.5)	3.0 (3.0;4.0)	0.4526
Milk	6.0 (5.0;7.0)	6.0 (4.5;7.0)	0.8489
Yogurts, buttermilk	5.0 (4.0;6.0)	5.0(4.0;6.0)	0.5623
Cottage cheese	4.0 (3.0;5.0)	4.0 (3.0;5.5)	0.4581
Cheese	5.0 (4.0;6.0)	5.0 (4.0;5.0)	0.0742
Cheese with mold	3.0 (1.5;3.0)	1.5 (1.0;3.0)	0.1617
Eggs	4.0 (4.0;5.0)	3.0 (3.0;4.0)	0.9116
Lean pork (pork, beef)	5.0 (4.0;5.0)	5.0(5.0;6.0)	0.3699
Fatty pork (pork knuckle)	1.0 (1.0;2.0)	1.0 (1.0;2.5)	0.2778
Beef, veal	2.0 (1.0;3.0)	2.0 (1.5;3.5)	0.7179
Chicken, turkey	5.0 (4.0;6.0)	5.0 (4.0;6.0)	0.5972
Goose, duck	1.0 (1.0;2.0)	2.0 (1.0;2.0)	0.7264
Fish	4.0 (3.0;4.5)	4.0 (4.0;5.0)	0.2541
Seafood	1.5 (1.0;2.0)	1.0 (1.0;2.0)	0.6174
Meats	6.0 (5.5;7.0)	6.0 (5.5;7.0)	0.7757
Frankfurters, luncheon meat, canned	2.5 (1.0;4.0)	3.0 (1.0;4.0)	0.6392
Butter	6.0 (4.0;7.0)	6.0 (4.0;7.0)	0.8564
Cream	3.5 (2.0;5.0)	4.0 (3.0;5.5)	0.1328
Lard	1.0 (1.0;3.0)	2.0 (1.0;3.0)	0.5073
Vegetable Oils	5.0 (5.0;6.0)	5.0 (5.0;6.0)	0.9978
Margarine, vegetable butter	1.0 (1.0;4.0)	3.0 (1.0;5.0)	0.2446
Potatoes	5.0 (4.0;5.0)	5.0 (4.0;6.0)	0.4446
Vegetables	6.0 (5.0;7.0)	6.0 (5.0;7.0)	0.5442
Fruits	6.5 (6.0;7.0)	6.0 (5.0;7.0)	0.5290
Legumes (peas, beans)	2.0 (1.5;3.0)	2.0 (1.0;3.0)	0.5777
Sugar	4.0 (2.0;7.0)	5.0 (4.0;7.0)	0.5098
Jams	3.0 (3.0;5.0)	4.0 (2.0;4.5)	0.4126
Honey	3.0 (3.5;5.0)	3.0 (2.0;4.0)	0.1121
Carbonated drinks	2.0 (1.5;3.0)	3.0 (1.0;4.0)	0.7107
Juices	4.0 (3.0;5.0)	4.0 (3.0;5.0)	0.9306
Sweets	5.0 (4.5;6.0)	5.0 (4.0;6.0)	0.3085
Fast food	3.0 (2.0;4.0)	2.0 (1.5;3.0)	0.1317
Beer	4.0 (3.0;4.0)	5.0 (4.0;6.0)	0.6106
Wine	3.0 (2.0;3.0)	2.0 (1.0;3.0)	**0.0166**
Spirits	2.0 (1.5;3.0)	2.0 (1.0;7.0)	0.6680
Coffee	7.0 (5.0;7.0)	7.0 (5.0;7.0)	0.9510
Tea	7.0 (5.0;7.0)	7.0 (6.0;7.0)	0.0883

Me-median; IQR-interquartile range

It has been revealed that the patients with IBS drank wine substantially more often (1-2 times a month, R=3.0) than subjects of the control group, who drank wine less often than once a month (R=2.0, p=0.0166).

In comparison to women of the control group, women with IBS most often consumed oatmeal (p=0.0628), pastry (p=0.4130), floury dishes (p=0.4526), blue cheeses (p=0.1617), eggs (p=0.9116), seafood (p=0.6174) and fast-food (p=0.1317). On the other hand, in comparison to healthy women, subjects suffering from IBS were characterized by customary low consumption of groats (p=0.8120),

rice (p=0.4463), wheat bread (p=0.5662), rye bread (p=0.0650), duck and goat meat (p=0.7264), sausages and canned food (p=0.6392), cream (p=0.1328), margarines (p=0.2446), jams (p=0.4126) and sodas (p=0.7107).

The caloric content of the evaluated daily food rations, and the nutrient content (basic nutrients and selected minerals) for women with IBS, and women of the control group was presented in Table 4. A higher intake of sucrose was observed among women with IBS, than in the case of control group. A substantially lower intake of dietary fiber was noted among patients with IBS, than in the case of the control group (p=0.0169). The analysis of the results indicated that patients with IBS consumed significantly more water (derived from drinks and food products) than women of the control group (p=0.0267). In both groups, an insufficient intake of plant protein and polyunsaturated fatty acids was noted.

Table 4. Average energy value and content of selected nutrients in daily food rations of women with irritable bowel syndrome and women in the control group

		IBS patients (n=32)			Controls (n=32)			
Energy and nutrients	Unit	Mean ± SD	Norm	% of the norm	Mean ± SD	Norm	% of the norm	P value
Energy	kcal	2003.0±1269.3	1950.0	102.7	1871.2± 666.1	1950.0	95.9	0.6047
Water	ml	1904.6±542.0	2000.0	95.2	1552.1±691.4	2000.0	77.6	0.0267
Total protein	g	74.2 ± 42.5	58.6	126.8	80.0±37.3	58.6	136.1	0.5872
Animal protein	g	48.2±31.9	29.3	164.8	53.6±34.1	29.3	183.2	0.5126
Vegetable protein	g	24.8±14.1	29.3	84.78	25.00±9.00	29.3	85.4	0.9531
Total carbohydrates	g	260.0 ±145.3	282.7	91.9	231.5± 87.1	282.7	81.9	0.3464
Dietary fiber	g	11.3 ± 12.1	25.0	45.2	17.5± 7.8	25.0	70.0	0.0169
Total fats	g	74.0 ± 62.7	65.0	113.8	69.4±44.7	65.0	106.8	0.5194
Saturated fatty acids	g	29.6± 19.8	15.2	194.7	27.8± 17.4	15.2	182.9	0.3070
Monounsaturated fatty acids	g	30.2± 16.0	32.5	92.9	28.4± 13.6	32.5	87.4	0.6295
Polyunsaturated fatty acids	g	14.2± 14.8	17.3	82.1	13.4± 13.5	17.3	77.4	0.8220
Cholesterol	mg	284.4± 160.8	300.0	94.8	277.4± 240.9	300.0	92.5	0.8917
Saccharose	g	37.2±51.4	195.0	19.1	25.7±17.4	195.0	13.2	0.2395
Lactose	g	7.4±10.7	-	-	5.1±7.0	-	-	0.3215
Sodium	mg	3653.7±1762.0	1500.0	243.6	3576.6±2034.1	1500.0	238.4	0.8717

SD – standard deviation

The total supply of protein in general, animal protein, fat in general, saturated fatty acids and sodium exceeded the recommended norm, both among women with IBS and subjects of the control group.

DISCUSSION

The symptoms of IBS develop mainly in the third or fourth decade of life, but they may also concern children and youth, as well as people over their middle-age or even over the age of 80. More and more studies suggest that most patients with IBS are women aged below 45 [10, 30, 35]. *Khademolhosseini* et al. showed that the incidence of IBS was related to age (most cases concerned young people) [17]. By contrast, no connection was observed between the onset of symptoms of IBS and the age of sufferers in China and in England [11, 37]. In this study, the age of women with IBS was 31.5±9.4, whereas in the control group the age was 32.9±8.2.

It was established that most patients are women with appropriate body mass (average BMI of the subjects – 23.9±3.3 kg/m^2, BMI of the subjects of the control group – 24.5±3.2 kg/m^2). 68.8% of women of the test group and 65.6% of women of the control group had appropriate body mass.

Most of the subjects were married people, having a university degree. *Farzaneh* et al. demonstrated that single persons with secondary or lower education, unemployed and those having a lower BMI (<25 kg/m^2) were remarkably more prone to IBS (particularly when it comes to women with BMI <25 kg/m^2, OR=0.94; 95%: 0.89-0.99, p=0.04) [7]. On the other hand, *Chirila* et al. showed that amongst patients with IBS, 49.5% were overweight (25.0-29.9 kg/m^2), and 20.8% were obese (≥30.0 kg/m^2) [3]. In this study, 25.0% of the sufferers were overweight, and 3.1% were obese.

In the presented dietary assessment of people with Irritable Bowel Syndrome, it has been revealed that in both of the tested groups, a 4-meal dietary plan was prevailing. Both women of the test group, and women of the control group most often consumed breakfast, dinner and supper. The rules of a rational diet promote consumption of 4 to 5 meals a day [13].

The caloric value of a daily food ration of the tested women was in line with the recommended norms, and it amounted to 2003.0±1269.3 kcal in the test group and 1871.2±666.1 kcal in the control group (a discrepancy of no statistical importance). The study of the diet of selected groups of Lower Silesian population, similar in age to the group of evaluated patients, demonstrated a tendency to follow diets with low caloric values, enabling to fulfill the norms at a level of 78,4% of the food rations of healthy women (an average of 1322.7 kcal) [12].

The most common mistake made both by the test group patients and the control group patients was snacking between the meals. Most of the tested women, as many as 83.0%, reached for sweets. Women of the control group consumed those products less commonly (58.0%). The analyzed food rations deliver sucrose at a level of 19.1% of the norm for the group of patients with IBS and 13.2% of the norm for the control group. The recommended daily portion of carbohydrates in our country is 130.0 g, and the amount of energy derived from the added sugars, that are being consumed, should not exceed 10.0% of the total caloric intake needs [13]. A positive correlation between the intensification of symptoms and consumption of products rich in sucrose was observed among patients with IBS. These products may cause excessive gas, flatulence, osmotic diarrhea and stomach ache [9].

Women with IBS did not consume fast food dishes and sandwiches, however these products were consumed by healthy individuals (4.0% and 11.0% of the subjects, respectively). More and more researchers point out that inappropriate diet may contribute to the intensification of IBS ailments. It has been shown that a significant proportion of patients with IBS individually remove some of the food products from their diet, namely those that intensify the disease symptoms, such as: milk, apples, pears, onion, cabbage, peanuts, whole-wheat flour products, coffee and chocolate [5, 19, 36].

In this study, it has been indicated that the intake of dietary fiber in the diet was significantly low among women with IBS (45.2% of the norm), and it amounted to 11.3±12.1g, averagely, in comparison to the patients of the control group (70.0% of the norm, average intake 17,5±7,8 g, discrepancies of statistical importance p=0,0169). The consumption of cereal products, rich in dietary fiber, influences the functioning of the digestive tract. The deficiency of fiber in the diet may cause long-lasting disturbances in the regular intestinal responses. Low supply of fiber in the diet may also constitute one of the primary developmental factors of the IBS with constipation. Gradual increase in its level in the diet may improve the motion functions in the intestines. It was observed that many fiber-rich products, such as whole-grain products, vegetables, legume plant seeds, dark rice, whole-meal pastas cause unfavorable symptoms within the digestive tract, in IBS sufferers. Nevertheless, they should not be entirely removed from the diet, instead only those causing adverse effects should be eliminated [9].

In this study, food products containing cereal grain proteins (wheat, rye and barley) were consumed by women of both of the tested groups, at least 1-2 times a month or more often. Those products may intensify the pain among some of the IBS sufferers, who at the same time do not suffer from coeliac disease (68.0% of patients suffered from stomach ache, flatulence, exhaustion) [2]. Polish study demonstrated that the frequency of positive serological tests for coeliac disease in patients with IBS was remarkably higher than in the control group (32.0 *vs* 0.0, $p<0.001$). The histopathological image of the mucous membrane of the duodenum, in all the people who gave consent to duodenoscopy, from the group with a positive titer of the anti-tTG and/or AGAs antibodies (n = 20), was appropriate. The gluten intolerance among people with IBS occurs significantly more often than in the general population, therefore it is justified for them to undergo serological tests for coeliac disease or gluten intolerance. The most common manifestation of the coeliac disease in patients with IBS is the latent from [25].

It is worth noticing that milk and dairy products were consumed in both of the tested groups, with a similar frequency (2-3 times a week and more often). *Okami* et al. pointed out that the female group with IBS consumed less milk and dairy products, in comparison to the control group [22]. In the study performed by *Chirila* et al., it has been shown that consumption of milk substantially contributes to the occurrence of disease symptoms [3]. The same study, involving 193 people with IBS (80 men and 113 women), indicated that the patients consumed processed canned food, meat preserves, legumes, pastry, fruit compotes and herbal teas significantly more often than healthy subjects [3]. The type of consumed food may contribute to the occurrence of disease symptoms through several mechanisms, including allergy or food intolerance. Atkinson pointed to a significant betterment of general sensation and a 26.0% reduction of the disease symptoms ($p<0.001$), following a 12-week elimination diet, based on the study of the titer of characteristic IgG antibodies, in the presence of selected nutrients [1]. *Drisko* et al. demonstrated an

increased concentration of IgG class antibodies, in the presence of selected nutrients, among 20 patients with IBS. Following 6 months of staying on an elimination diet, accompanied by probiotic supplements, a remarkable reduction of disease symptoms in the form of a decrease in defecation frequency and the degree of experienced pain (p=0.05), along with improvement of the quality of life (p=0.0001) were noted [5]. Some food products may alter the composition of the bacterial flora, directly or indirectly influencing the metabolism of bacteria, and thus evoke the IBS symptoms [20]. Clinical tests indicated that patients with IBS have a different composition of the bacterial flora, from healthy individuals [15, 21, 24]. The molecular analysis of the feces samples showed that the *Firmicutes* / *Bacteroidetes* ratio is 2-times higher among Dutch patients with IBS [21]. According to *Kerckhoffs* et al. study, the *Pseudomonas aeruginosa bacillus* are more often found in patients with IBS, than in healthy ones [16].

In this paper, the assessment of the nutritional value of daily food rations revealed that the intake of protein in general among the tested women was high (126.8% of the norm for patients with IBS and 136.1% of the norm – patients of the control group; a discrepancy of no statistical importance; it equaled 74.2 ±42.5 g in the group with IBS and 80.0±37.3 g in the control group). The study conducted by the authors from Wroclaw showed that the intake of protein among healthy women amounted to 111.5% of the recommended norm of intake [12]. The proportion of this nutrient in the twenty-four-hour caloric value structure should amount to 12.0 – 15.0% [13]. The consumption of animal protein in both of the examined groups exceed the recommended norm (164.0% of the norm – patients with IBS and 183.2% of the norm – patients of the control group) and it amounted on average to 48.2±31.9 g in the study group and 53.6±34.1g in the control group. Insufficient intake of plant protein among the tested women (84.8% of the norm) might reflect the rare consumption of legumes (less often than once a month). Those products contain gas producing oligosaccharides, such as: stachyose and raffinose. Humans do not digest these compounds, they are broken down by bacteria in the large intestine. This process is accompanied by extensive release of gases, methane, carbon dioxide and hydrogen. Because of the lowered pain threshold, IBS sufferers suffer more intensely from such ailments as flatulence, gases, stomach aches, caused by the excessive consumption of plants rich in stachyose and/or raffinose [9].

In this study, it has been demonstrated that the intake of fat in general, among all the tested women, slightly exceeded the recommended norms (it amounted to 113.8% of the norm in the test group and 106.8% in the control group) and constituted on average 74.0±62.7g in the study group and 69.4±44.7 g in the control group. In compliance with the guidelines, the percentage of energy, derived from fats in general, should not be higher than 30.0%. The inappropriately balanced diet, along with excessive consumption of fat in general may lead to weight gain [13]. In this study, it has been shown that butter is a popular fat spread on bread (patients of both groups consumed butter 4-6 times a week). In most patients suffering from IBS, the intake of date may cause the occurrence of gastrointestinal diseases (feeling of fullness, flatulence, nausea). Since lipids may hinder small intestinal motor activity and slow down the motility of intestines, they might also cause retention of gases, and subsequently result in flatulence [8]. On the other hand, there is evidence that lipids stimulate the motor activity in the colon through the gastrocolic reflex. Such a reflex is intensified in patients with IBS, and it leads to diarrhea [27]. *Simrén* et al. [32] also revealed that stomach emptying is hindered if fats are present in the duodenal tube tip. Large quantities of fat consumed at once may excessively stimulate intestinal contractions, therefore it is recommended to consume smaller amounts of this component, apportioned evenly during the day [9].

In both of the examined groups, saturated fatty acids were consumed in excessive quantities (over 180.0% of the norm), amounting on average to 29.6±19.8 g among women with IBS and 27.8±17.4g among women of the control group (a discrepancy of no statistical importance). The supply of the polyunsaturated fatty acids in the diet was insufficient, and equaled 82.1% of the recommended norm, among women with IBS, amounting on average to 14.2±14.8 g, whereas among women of the control group it equaled 77.4% of the recommended norm, amounting on average to 13.4±13.5 g (a discrepancy of no statistical importance). Similar results were obtained by researchers, when it comes to the consumption of SFAs and PUFAs among the inhabitants of Lower Silesia [12].

It has been demonstrated that the average cholesterol content (284.4±160.8 mg in the test group and 277.4±240.9 mg in the control group) in the diets was compliant with the obligatory norms [13].

In accordance with the Polish dietary recommendations, the daily supply of carbohydrates should cover 55.0 – 60.0% of the caloric intake needs of the system [13]. Among the tested women of both groups, the content of this element equaled 91.9% of the recommended norm, and amounted on average to 260.0±145.3g in the group of patients with IBS, and 81.9% of the recommended norm, amounted on average to 231.5±87.1g in the control group (a discrepancy of no statistical importance).

Some carbohydrates, such as fructose (fruit sugar) or lactose (milk sugar) may cause gastric disorders, such as: diarrhea, gases, flatulence or stomach cramps [18]. In this study, fruit and milk were consumed by both tested groups, 4-6 times a week. The lactose content in the examined food rations was 7.4±10.7 g in the group of patients with IBS and 5.1±7.0 g in the control group (a discrepancy of no statistical importance). Among patients with IBS, the sensibility threshold when it comes to these sugars is additionally lowered, hence even their tiny amounts may cause irritation of the digestive tract, leading to disorders. Reports have occurred in literature, elaborating on the positive influence of limiting the amounts of the consumed carbohydrates (FODMAP diet) on the mitigation of gastric disorders [26, 28, 29].

In this study, sweets, cakes, candies, crackers were consumed by both groups of women 2 – 3 times a week. Both sorbitol (E420), xylitol (E967) and mannitol (E421) are polyalcohols showing sweetening properties. They are added in pastry production. Among people with IBS, sorbitol might provoke the occurrence of gases, flatulence, osmotic diarrhea and stomach aches [29, 33, 36]. Xylitol and mannitol also reveal properties to accelerate intestinal peristalsis, which may foster the occurrence of diarrheas, following extensive intake of products containing those compounds [9].

In the performed studies, it is worth noticing that the group of women with IBS consumed fast food too often, in comparison to healthy women. Such products typically contain hot, spicy seasoning. The study of *Esmaillzadeh* et al. [6] demonstrated that the intake of spicy dishes rich in pepper, curry, ginger and turmeric is strictly connected with the disease symptoms, especially among women. Women who consumed hot dishes 10 times a week or more often were twice as much prone to IBS than women who had never consumed spicy food (OR=2.03; 95%CI:1.09-3.77, P=0.02) [6]. Processed food products also contain large amounts of sodium. The food rations of the tested patients exceeded twice the level of appropriate sodium intake. The excess of sodium in CRP is considered to be one of the dietary risk factors in terms of arterial hypertension and stroke [38]. The data derived from research conducted for over a decade point to common occurrence of the coronary artery disease and other cardiovascular diseases [4].

The significant increase in the consumption of wine by patients with IBS, compared to healthy women (p=0.0166), indicated in this study, might have a negative influence on the functioning of the digestive tract of IBS sufferers. The increased doses of ethyl alcohol cause the damage of the mucous membranes, inter alia, in the stomach and in the intestines, which emerge as gastrointestinal suppression of the immune system, and intensified penetration by toxic substances. It can also be the cause of an increased intestinal dysbiosis and systemic infection. Upon regular consumption of ethanol, disorders in digestion and absorption might occur, which promotes deficiencies in nutrients [38]. Through irritating the receptors of nerve endings and shortening the time when chime comes into contact with the intestinal wall, alcohol is the cause of diarrheas. It may also cause the occurrence of severe stomach aches and heartburn [28, 36].

The results concerning the water supply in the group of patients with IBS, which amounted on average to 1904.6±542.0 ml (95.2% of the norm) and was remarkably higher (p=0,0267) than in the control group – 1552.1±691.4 ml, are satisfactory. In this study, all women drank coffee and tea on a daily basis. Such products excessively stimulate the intestinal motility through intensified contractility of the small intestine and increased gastrointestinal excretion. The disorders of the proper functioning if the lower section of the digestive tract contribute to the occurrence of stomach aches, diarrheas, flatulence and heartburn. Caffeine or its derivatives also have diuretic properties, resulting in excreting excessive amounts of fluids during the day. People with IBS should take particular care of an appropriate level of fluids in their diet, in order to maintain the proper degree of hydration [9, 26].

CONCLUSIONS

1. The preliminary study suggests that there are significant improprieties when it comes to the dietary habits of women with IBS. Patients suffering from IBS most often consumed sweets and fruit between the meals. They also much more often consumed corn flakes and wine, in comparison to women of the control group.
2. The examined diets of patients with IBS are characterized by a substantially lower intake of dietary fiber and remarkable higher consumption of water than in the case of women of the control group. In both of the tested groups, insufficient intake of plant protein and polyunsaturated fatty acids was reported. The supply of protein in general, fat in general, saturated fatty acids and sodium exceeded the recommended norm, both among women suffering from IBS and women of the control group.
3. In order to eliminate these mistakes in the future, it seems justified to extend the knowledge on rational nutrition amongst patients with IBS.

Conflict of interest
The authors declare no conflict of interest.

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