

Comparison between gluten-free regime and regime with gluten in symptoms of patients with irritable bowel syndrome (IBS)

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ABSTRACT

Background and Objective: Irritable bowel syndrome (IBS) is the most common gastrointestinal disorder and accounts for most of the referrals of patients to gastroenterologists. Given the high prevalence of this syndrome and its significant effect on the reduced quality of life of patients, the present study aimed to investigate the effect of using gluten-containing or gluten-free diet on symptoms of patients with irritable bowel syndrome. **Materials and Methods:** In this trial, 140 patients with irritable bowel syndrome who referred to Imam Khomeini Hospital (2006) were randomly divided into two groups based on Rome III criteria. Seventy patients received a gluten-free diet and rest patient received a regular diet as control group for 12 weeks. In order to compare the quantitative characteristics, independent samples T-test was used, while Mann-Whitney and Z-tests were used to compare the qualitative characteristics. **Findings:** There was no significant difference between the control group (9.8 ± 37 years) and the group with gluten-free diet (0.2 ± 37 years) in terms of mean age. The effect of gluten-free diet on intestinal gas, fecal consistency, urgent need for expulsion, and insufficient defecation were higher than in control group. Although abdominal pain and reduced frequency of bowel movements were higher in the control group than gluten-free diet group ($P < 0.05$). The positive response to general improvement in the gluten-free group and in the control group was 67% and 52%, respectively. **Conclusion:** According to present results, providing gluten-free diet could be improved patient treatment's symptoms. Also, it seemed that the duration of treatment can lead to better therapeutic outcomes.

Keywords: Gastrointestinal disorders, gluten, irritable bowel syndrome (IBS)

Introduction

Irritable bowel syndrome (IBS) is a functional disorder of the digestive tract, which is diagnosed based on symptoms such as chronic abdominal pain and bowel movements in the absence of any organic cause.^[1] It is estimated that the prevalence of irritable bowel syndrome in developed countries is 20%. It is also one of the most common diseases of the gastrointestinal tract.^[1]

This disease is known as the most commonly diagnosed gastrointestinal disorder which accounts for 12% of referrals to gastroenterologists.^[2] This syndrome can increase health care costs both directly and indirectly. The estimations show that it imposes \$ 30 million on the US health system.^[3] According to the studies, the prevalence of IBS in North America and Europe is 10–15% and 11.5%, respectively.^[4] However, the prevalence of IBS varies widely between countries. According to population surveys conducted in Iran, the prevalence of IBS is 3.5–8.8%. It seems that the disease is higher in certain populations. For example, in a study carried on medical students, the prevalence of IBS was 18.5%.^[5,6] In another study which was conducted by

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Mansouri *et al.* (2008) on 18,180 people in Tehran, Iran, 15.3% of the patients complained about gastrointestinal symptoms and the prevalence of IBS was 1.1%.^[7]

A case study in North America showed that women suffered from IBS two times more than men. Mansouri *et al.* (2008) estimated that women suffered from IBS 2.2 times more than men.^[7]

Recent studies of patients with irritable bowel syndrome (IBS) emphasize the important role of mucosal inflammation and the activation of the immune system in the onset of symptoms. In this theory, the symptoms of irritable bowel syndrome originate from an interaction between the environmental factors and the genetically susceptible host. In this method, the mucosal inflammation (following infections or with unknown cause) increases the permeability of the mucous membrane in the small intestine and colon which is followed by the activation of the secretory reflex and stimulation of the sensory roots in the intestines. These patients show signs of predominant diarrhea (stimulation of secretory reflex), abdominal pain (stimulation of sensory roots in the intestines) and bloating. Irritable bowel syndrome is caused by infections, mast cells and lymphocytic cells in the intestinal mucosa, increased levels of inflammatory cytokines and response to unabsorbed antibiotics in these patients which are all an indicative of the mechanism of mucosal inflammation in patients. These findings can help scientists detect new and more specific treatments for patients.^[5]

The relation between IBS symptoms and the gluten-containing diet is very complicated and not well understood. The prevalence of celiac disease in patients with chronic functional diarrhea or IBS with diarrhea-predominant (IBS-D) is about 0.4%, similar to the healthy control group.^[5]

Non-celiac patients (IBS-D) with positive HLA-DQ2/8 can improve their symptoms by using gluten-free diet. Given the serum IgG (rather than IgA) associated with celiac disease in 37% of IBS-D patients, an adaptive immune response mechanism has been developed in response to gluten exposure in order to explain how to improve the symptoms when the gluten intake is stopped.^[6]

Accordingly, changes in permeability and inflammation of the intestine can cause symptoms in IBS-D patients who tend to consume gluten. Moreover, changes in the permeability of the intestine or tight junctions have been described in IBS-D,^[8-10] including post-infectious IBS-D.^[11] However, the degree of increased permeability of small intestine in gluten sensitive patients is relatively small, compared to those with celiac or healthy subjects.^[10] Given the high prevalence of IBS, its significant effect on the reduced quality of life of patients, the new findings which aim to explain the role of mucosal inflammation and the activation of the immune system in the pathogenesis of this disease, the present study was an attempt to investigate the effect of gluten-free diet on the symptoms of patients with irritable bowel syndrome.

Materials and Methods

This study is a randomized double-blind clinical trial. The study sample included the patients referring to the Gastroenterology Clinic of Imam Khomeini Hospital in Ahwaz. They showed symptoms of chronic abdominal pain, diarrhea, chronic or recurrent constipation and abdominal bloating.

Accordingly, 140 patients with irritable bowel syndrome who had Rome III diagnostic criteria and did not respond to first and second treatments entered the study. The patients diagnosed with celiac disease or organic causes were excluded. The patients were randomly divided into two groups of 70. The patients who referred to the gastroenterologists on even days were assigned to the intervention group, while those who referred to the gastroenterologists on odd days were assigned to the control group. Finally, the questionnaires which included demographic information and symptoms of the patients were completed by the questioner.

Four weeks after the completion of the treatment, the symptom questionnaire was completed for the patients once again. Finally, the symptoms of the patients in both groups were evaluated before the treatment. In this study, the response to treatment was evaluated based on the following criteria:

The first criterion was the Gastrointestinal Symptom Rating Scale, in which symptoms of irritable bowel syndrome such as abdominal pain, bowel gas, decreased bowel movements, increased frequency of bowel movements, decreased fecal consistency, increased fecal consistency, urgent need for excretion of feces and insufficient defecation were graded from 0 to 3, according to the intensity of the symptoms.

The second criterion was the questionnaire that was evaluated with yes/no questions. At the end of the treatment, the patients were asked if they felt better and satisfied more than 50% after the treatment.

Data analysis

In order to analyze the data, paired *t*-test was used. In addition, multivariate paired *t*-test was used to compare the variables. Finally, the data were analyzed using the SPSS (version 19).

Results

The mean age in the control group and the group with gluten-free diet was 9.8 ± 37 years and 00.2 ± 37 years, respectively. The two groups were not significantly different in terms of age. In the control group, 42 patients were women and 28 patients were men. However, in the group with gluten-free diet, 29 patients were men and 41 patients were women ($P = 0.774$). There was no significant difference between the two groups in terms of gender. There was a significant difference between the two groups in terms of abdominal pain, decreased fecal consistency, and urgent need for excretion ($P < 0.05$) [See Table 1].

In the control group, there was a significant decrease in the symptoms of abdominal pain, bowel gas, decreased bowel movements, increased fecal consistency, urgent need for excretion, and insufficient defecation ($P < 0.05$).

The effect of gluten-free diet on abdominal pain, bloating, fecal consistency, increased need for excretion, and incomplete defecation was significant ($P < 0/05$) [See Table 2]. Diagram 1 shows the mean score of symptoms in terms of Z test between the two groups.

The positive response after the treatment in the gluten-free group and the control group was 67% and 52%, respectively ($P < 0.022$).

Discussion

Irritable bowel syndrome (IBS) is a common disease in most countries. In most studies, Rome diagnostic criteria were used to diagnose the disease. In the present study, Rome III was used as the latest criterion. The treatments that are used today for patients are based on pathophysiological data.^[5]

According to the results of the present study, a gluten-free diet in patients with IBS led to a significant improvement in the symptoms of irritable bowel syndrome within 12 weeks. In addition to the gluten-free diet, patients who avoided foods that caused flatulence experienced faster improvement in their symptoms. Therefore, it is very important for these patients to use

gluten-free diet and avoid foods that cause flatulence (legumes, onions, celery, carrots, raisins, bananas, apricots, buds, etc.).

A study was carried out on 17 patients with IBS and predominant diarrhea, and the results showed that low-carb diet (4%) significantly improved compared to normal diet (carbohydrate = 55%), especially in reducing the frequency of bowel movements and abdominal pain in all 13 patients who continued the diet.^[12] A clinical trial study on 82 patients showed that reducing the foods causing flatulence improves pain and bloating.^[13] Hayes *et al.* showed that cereals especially breads and its other products (53%), spicy foods (39%), fatty foods, and vegetables (36% each) exacerbated the symptoms of the patients more than other food groups. Significantly, many patients with IBS showed a reduction in gastrointestinal symptoms with a change in diet, compared with healthy subjects.^[14]

Cooper *et al.* (1980) investigated eight women with abdominal pain and chronic diarrhea. The symptoms of these people improved significantly after gluten-free diet, but the symptoms reappeared by eating gluten-containing foods.^[15]

In a double-blind clinical trial Biesiekierski *et al.* examined the clinical symptoms of gastrointestinal and non-gastrointestinal symptoms in patients with irritable bowel syndrome who received gluten and gluten-free diets. This study was performed on 34 patients with IBS (based on Rome III Criteria) who showed an improvement in symptoms with a gluten-free diet for

Table 1: Comparison of the mean score of symptoms in the two groups before treatment

Symptoms	Control group	Gluten-free group	P
Abdominal pain	2.15	1.7	0.002
Intestinal gas	1.75	1.7	0.915
Reduced frequency of bowel movements	0.61	1.25	0.087
Increased frequency of bowel movements	0.97	1.11	0.167
Loose stool	0.37	0.92	0.002
Tight stool	1.43	2.56	0.084
Urgent need for excretion	0.59	0.97	0.0001
Incomplete defecation	1.3	1.15	0.503

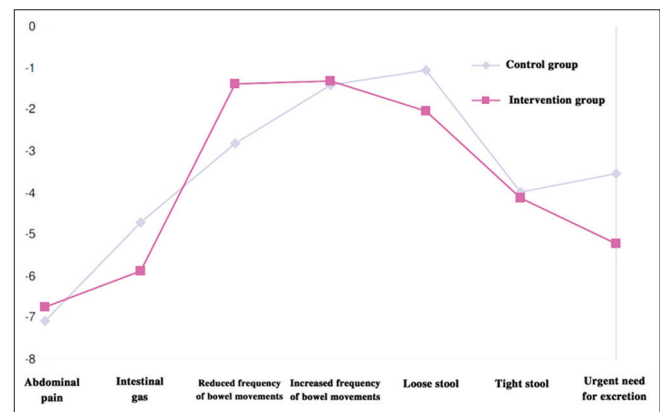


Diagram 1: The mean score of symptoms after receiving diet in two groups of patients

Table 2: Comparison of mean scores of symptoms before and after treatment in both groups

Symptoms	Control group			Intervention group		
	Before treatment	After treatment	P	Before treatment	After treatment	P
Abdominal pain	2.15	1.05	0.0001	1.7	0.73	0.0001
Intestinal gas	1.75	1.27	0.0001	1.7	0.89	0.0001
Reduced frequency of bowel movements	0.6	0.95	0.005	1.25	0.86	0.168
Increased frequency of bowel movements	0.97	1.06	0.162	1.11	0.97	0.193
Loose stool	0.37	0.43	0.294	0.92	0.69	0.04
Tight stool	1.43	0.94	0.0001	2.56	0.66	0.0001
Urgent need for excretion	0.59	0.39	0.0001	0.97	0.66	0.0001
Incomplete defecation	1.3	0.81	0.0001	1.15	0.82	0.0001

more than 6 months before the intervention. After 6 months, a large proportion of patients in the gluten group responded negatively (no) to the outcome of the initial questions. Compared with the gluten-containing group, those in the gluten-free group had a significant improvement in pain and bloating. However, no significant difference was found in the eructation and nausea. The results showed that gluten-free diet in patients with irritable bowel syndrome is directly associated with the improvement of symptoms such as abdominal pain, flatulence and fatigue stability. The results are in good agreement with those of the present study.^[16]

Vazquez-Roque *et al.* (2013) compared the gluten-containing group and gluten-free group in a clinical trial. The results showed that people with a gluten-free diet had more bowel movements during the day, compared to those who received gluten-free diet. Moreover, this study showed that gluten-containing diet increased the permeability of the small intestine, but this effect was not seen in the permeability of the large intestine.^[17] This study was in good agreement with the current study and showed the effect of gluten-free diet on the improvement of IBS symptoms. Umberto Volta (2014) evaluated the effects of gluten-free diet on patients with IBS and the results indicated that gluten-free diet had significant effects on the improvement of IBS symptoms and performance.^[18]

Biesiekierski *et al.* evaluated all IBS criteria in all participants in order to investigate the non-celiac gluten sensitivity. There are several reasons why a gluten-free diet may have a positive effect on irritable bowel syndrome. This may be partly attributed to lack of fiber in a gluten-free diet, which facilitates digestion for patients with no gluten sensitivity.^[19] Many patients who are diagnosed with irritable bowel syndrome are in fact suffering from celiac disease. Celiac shows symptoms which are part of the irritable bowel syndrome criteria and the removal of gluten from the diet of these individuals improves their symptoms.^[19] Additionally, irritable bowel syndrome is a non-celiac gluten sensitivity (NCGS) disorder.^[20]

The term NCGS refers to people who do not suffer from celiac, but their symptoms improve by removing gluten from their diet. In clinical trial studies, even in those with negative celiac tests, removing gluten from the diet improved the symptoms of the patients.^[16,21] Some believe that there is probably a different substance other than gluten in wheat that stimulates the immune system. Moreover, removing wheat from the diet will remove the substance and improve the symptoms.^[19] Presumably trypsin and amylase or fermentable short-chain carbohydrates in wheat cause the symptoms. Our study also suggests that gluten-free diet is helpful for patients with IBS to reduce symptoms. There is also evidence that a gluten-free diet improved the symptoms of patients with IBS. Atkinson *et al.* (2004) investigated 150 patients with IBS who underwent IgG-containing and IgG-free diets. This study showed that foods based on IgG antibodies may reduce IBS symptoms.^[22] Wahnschaff *et al.* investigated the response of gluten-free diet on 41 patients with IBS and diarrhea in a

prospective study (without a clinical trial). All patients were subjected to serological tests and small intestinal biopsy for celiac disease. A group of patients with IBS were investigated by a defective antibody test along with non-diagnostic biopsy results. Accordingly, IgG antiglyadine significantly decreased after 6 months in patients with IBS who had HLA-DQ2+. In addition, the gastrointestinal symptoms improved after this diet.^[20] Since the disease persists for a long time and the effects of long-term treatments have not been established, the diet will be effective in controlling the symptoms of these patients. Therefore, it is recommended that foods containing gluten, lactose, fructose, galactan, sorbitol, and fructan should be removed from or limited in diet before starting the medication.

Conclusion

In general, the findings of the present study showed that gluten-free diet has a significant effect on the reduction of symptoms in irritable bowel syndrome (IBS). The results showed that symptoms improved in most patients. It also seems that the duration of the treatment plays a key role in achieving better therapeutic outcomes. Therefore, it is suggested that these methods be included in the care programs of patients with irritable bowel syndrome so that patients can benefit from many advantages.

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Conflicts of interest

There are no conflicts of interest.

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