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Original Article

Relationship of constipation and irritable bowel syndrome with food intake, anthropometric measurements and eating behaviors in male students

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ABSTRACT

Background and Objectives: Gastrointestinal disorders like irritable bowel syndrome (IBS) and constipation can affect the quality of life; and various factors play a role in these disorders. The aim of this study was to investigate the environmental factors related to these problems among Iranian male university students.

Materials and Methods: The study was conducted on 186 male students at Ahvaz Jundishapur University of Medical Sciences. Rome Criteria III (to identify gastrointestinal disorders), Dutch eating behavior, food pattern brief instrument and international physical activity questionnaires were completed by all participants; moreover, their anthropometric measurements were taken.

Results: The results showed a significant difference in weight, body mass index (BMI), waist circumference, hip circumference, and waist to hip ratio in the students suffering from constipation compared with the healthy ones. The students with constipation had more significant milk intake and those with IBS had less intake of vegetables. No significant differences were observed in the eating behavior of students with constipation and IBS, and the healthy ones.

Conclusions: Weight and other anthropometric indices could be considered as factors related to constipation. According to the results, an appropriate and balanced intake of different food groups with emphasis on vegetables, milk and dairy products could be recommended.

Keywords: Irritable bowel syndrome (IBS), Constipation, Diet, Anthropometry

Introduction

Functional gastrointestinal disorders (FGIDs) are problems that involve every part of the gastrointestinal tract. Irritable bowel syndrome (IBS) and chronic constipation are common problems (1). Constipation as a common digestive problem of the human population is characterized by hard, infrequent and incomplete stool elimination (2). Constipation affects the health index and quality of life (3), and people who suffer from constipation have lower quality of life. Constipation is prevalent in many different countries; a research that compared constipation prevalence among different countries reported a prevalence range of 2.6 to 26.9% (4). Constipation has various pathological causes; however, in healthy people, inappropriate diet and insufficient physical activity are factors related to the occurrence of constipation (5).

IBS, as other FGIDs, is defined by symptoms like abdominal pain and discomfort with changes in the habitual pattern of the lower gastrointestinal tract (6). IBS incidence has increased during the last few years in Asian countries and approached the incidence in the western countries (7, 8). Although IBS prevalence in Iran is lower than in the western countries, its increased incidence rate needs more attention (9). IBS pathophysiology is not clear but sex, diet, lifestyle, psychological disorders, sleep disorders and stress are considered as IBS risk factors (10-13).

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It is believed that lactose intolerance, bile acids' mal-absorption, and short chain fatty acids (resulted from fiber or resistant starch fermentation) affect the IBS symptoms (14). It is possible that eating behavior could worsen the symptoms of IBS, as a study showed that IBS patients eat in a hurry (15). A research on medical students in China showed significant differences in the height and age of students suffering from IBS compared with the healthy control group; however, no significant difference was shown in intake of foods like coffee, carbonate beverage, fruit, milk, meat, fish and fatty or spicy foods between the students with IBS and the healthy control (16).

University students are part of the community that are exposed to many problems like physical and psychological complications because they live far from family and undergo lifestyle changes. To our knowledge, the relationship of eating behavior with IBS and constipation has not been investigated yet; also the prevalence of IBS and constipation has not been studied among different ethnicities in Iran. Different ethnicities (such as Lor, Bakhtiyari, Lak, Kurd, Turk, Arab and Persian) can be found among students who study at Ahvaz universities; therefore, this study was conducted on male students to assess the prevalence of IBS and constipation among different ethnicities. Also the relationship of eating behavior, food intake and anthropometric measurements with IBS and constipation was studied.

Materials and Methods

This research was a cross-sectional study and was conducted on 186 male students residing at Ahvaz Jundishapur University of Medical Sciences dormitories, in October 2014. A consent form was completed for all participants and they were assured of the secrecy of their information. Inclusion criteria were as follows: an age range of 18-25 years, absence of chronic diseases and having no history of stressful life events (such as the death of a family member or a loved one, divorce, getting married and so on) during the last three months; and exclusion criteria were poor cooperation to take anthropometric measurements and incomplete questionnaires.

The general questionnaire, which was completed by all participants; included questions about the students' age, level of education, ethnicity, marital status, and medical history in case of any disease condition. Rome criteria III questionnaire was used to identify constipation or IBS. Accordingly, a constipated subject must had experienced at least two of the following symptoms over the preceding three months: fewer than three bowel movements per week, straining, lumpy or hard stool, sensation of anorectal obstruction, sensation of incomplete defection and manual maneuvering required to defecate. For IBS, two or more of the following were applied: onset of pain related to a change in frequency of stool, onset of pain related to a change in the appearance of stool, and pain relieved by a bowel movement. Dutch Eating Behavior Questionnaire (DEBQ) was used to determine the students' eating behavior. In this questionnaire, eating behaviors were categorized into three classes and two sub-classes including emotional eating (emotional eating diffuse emotions and emotional eating clearly labeled emotions), restrained eating and external eating. The score of each eating behavior was calculated by the mean score of the related questions. The physical activity level was determined using the international physical activity questionnaire; activities were computed according to metabolic equivalents (METs), and the students were classified into three groups: 1) inactive, 2) minimally active, and 3) active. Food brief instrument questionnaire (17), according to food pyramid, was used to determine food intake. With this questionnaire, daily intakes of the most important foods for the past three months in each pyramid food group were asked. Foods were as follows: cereals and breads (including bread, rice and pasta), meat and alternatives (including all kinds of meat, egg, and legumes), dairy (milk, yogurt, Iranian yogurt drink (*doogh*) and ice cream), vegetables, fruits and oils groups.

The anthropometric measurements of all participants were taken. Weight and height were measured with an accuracy of 0.1 kg and 0.1 cm, respectively. Body mass index (BMI) was calculated based on the following formula: bodyweight in kilograms divided by height in meters squared. Inflexible measuring tape was used to determine waist circumference (WC) and hip circumference (HC). Waist to hip ratio (WHR) was calculated by the circumference of the waist (smallest part of the torso, usually slightly above the navel) divided by the circumference of the hip (largest part of the buttocks).

Data were analyzed by the SPSS software (version 17.0). One way ANOVA was used to compare the

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mean of quantitative variables between the three groups: constipation, IBS and healthy; Tukey post-hoc analysis was employed to determine significant difference between each of these three groups with others. Chi-square analysis was applied to show difference between the qualitative variables in the constipation, IBS and healthy groups.

Results

Twenty five (13.4%) and 19 (10.2%) students suffered from constipation and IBS, respectively, and 142 (74.4%) were apparently healthy. Table 1 shows the presence of these gastrointestinal disorders between different ethnicities; Chi-square statistical analysis showed significant difference in the presence of gastrointestinal disorders between different ethnicities. There was a significant difference between the nutrition students and those of other disciplines in the presence of gastrointestinal disorders. Furthermore, no difference was found between the students with various physical activity levels due to constipation or IBS (Table 1).

One way ANOVA showed a significant difference in milk and vegetable consumption between the three groups (Table 2). Tukey's post-hoc test showed a significant difference in milk consumption between the students suffering from constipation and healthy individuals (P=0.039) and IBS (P= 0.010). The test also revealed significant difference in vegetable intake between the IBS students and those with no gastrointestinal disorders (P=0.015).

Table 1. Number and percent of healthy students and those who suffered from constipation or IBS in different ethnicities, disciplines and physical activity levels

		IBS N (%)	Constipation N (%)	Healthy N (%)	Total N (%)	P-value*
Ethnicity						
	Lor, Lak, Bakhtiyari	8 (8.8)	9 (9.9)	74 (81.3)	91 (100)	0.021#
	Kurd	8 (29.6)	5 (18.5)	14 (51.9)	27 (100)	
	Persian and Others (Turk, Arab)	9 (13.2)	5 (7.4)	54 (79.4)	68 (100)	
Discipline						
	Nutrition	7 (36.9)	2 (10.5)	10 (52.6)	19 (100)	0.006#
	Others	18 (10.8)	17 (10.2)	132 (79)	167 (100)	
Physical activity level						
	Low	9 (12.7)	9 (12.7)	53 (74.6)	71 (100)	0.619
	Medium	11 (16.7)	7 (10.6)	48 (72.7)	66 (100)	
	High	5 (10.2)	3 (6.1)	41 (83.7)	49 (100)	

*Chi-Square statistical analysis. #Significant level < 0.05

Table 2. Mean (±SD) of daily food group serving intakes (according to Iranian food pyramid) in healthy students and those who suffered from constipation or IBS

Daily food group serving intakes	Gastrointestinal disorder			P-value*
	IBS	Constipation	Healthy	
Rice	6.21 ± 2.66	5.21 ± 2.25	5.47 ± 2.15	0.249
Pasta	0.72 ± 0.64	0.81 ± 0.93	0.7 ± 0.78	0.863
Bread	5.4 ± 3.7 b$	5.5 ± 3.2 ab	7.4 ± 4.7 a	0.048#
Total bread and cereal group	12.38 ± 4.92	11.55 ± 3.52	13.55 ± 4.52	0.118
Milk	0.24 ± 0.4 b	0.67 ± 0.53 a	0.38 ± 0.48 b	0.013#
Yogurt	0.9 ± 0.61	0.62 ± 0.4	0.87 ± 0.58	0.183
Doogh	0.64 ± 0.61	0.47 ± 0.57	0.83 ± 0.96	0.203
Ice cream	0.31 ± 0.34	0.26 ± 0.3	0.38 ± 0.45	0.427
Cheese	0.33 ± 0.44	0.67 ± 0.6	0.53 ± 0.63	0.171
Total dairy group	2.44 ± 1.58	2.7 ± 1.6	3.0 ± 1.76	0.289
Kinds of meat	2.07 ± 1.16	1.16 ± 0.75	2.12 ± 1.25	0.294
Legume	0.47 ± 0.43	0.35 ± 0.27	0.48 ± 0.45	0.494
Egg	0.83 ± 0.66	0.72 ± 0.65	0.6 ± 0.55	0.167
Total meat and substances group	3.38 ± 1.48	2.74 ± 1.25	3.21 ± 1.39	0.269
Fruit	2.12 ± 1.53	2.06 ± 1.43	2.16 ± 1.42	0.957
Vegetable	1.01 ± 0.61 b	1.38 ± 1.28 ab	1.74 ± 1.25 a	0.014#
Oil	7.92 ± 3.06	7.94 ± 1.98	7.87 ± 2.24	0.99

*One way ANOVA. #Significant level < 0.05
$Values bearing the same letters were not significantly different (Tukey post-hoc analysis)

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Statistical analysis showed a significant difference in some anthropometric measurements between students who suffered from the IBS or constipation and those with no gastrointestinal disorders (Table 3). Tukey's post-hoc test confirmed a significant difference in weight, BMI, WC, HC and WHR between the students who suffered from constipation and those with no gastrointestinal disorders (*P*=0.006, *P*=0.049, *P*=0.005, *P*=0.01 and *P*=0.049, respectively).

Table 4 indicates the score of different eating behaviors between students with gastrointestinal disorders and healthy individuals; no significant difference was found. The score of emotional eating diffuse emotions showed significant differences between Lor, Lak, Bakhtiyari with other ethnicities (including Turk and Arab, *P*=0.042), and also between Persians and other ethnicities (including Turk and Arab, *P*=0.006) (Table 4).

Food intakes were studied among different ethnicities. Yogurt, bread and vegetable intakes showed significant differences between different ethnicities (Table 5).

Table 3. Mean (± SD) of age and anthropometric measurements in healthy students and sufferers from constipation or IBS

Age and anthropometric measurements	Gastrointestinal disorder			P-value*
	IBS	Constipation	Healthy	
Age (years)	21.96±1.71	21.84±1.25	21.81±1.98	0.941
Weight (Kg)	73.24±15.9 [ab$]	78.84±11.74 [a]	69.57±11.43 [b]	0.005≠
Height (m)	1.75±0.07 [b]	1.81±0.07 [a]	1.76±0.06 [b]	0.009≠
Body mass index (kg/m^2)	23.8±4.26 [ab]	24.0±2.95 [a]	22.32±3.37 [b]	0.037[i]
Waist circumference (cm)	86.36±10.6 [ab]	89.63±8.07 [a]	82.12±9.78 [b]	0.002≠
Hip circumference (cm)	97.24±9.23 [ab]	99.78±6.64 [a]	94.38±7.28 [b]	0.006≠
Waist/hip ratio	0.88±0.04 [ab]	0.89±0.03 [a]	0.86±0.05 [b]	0.025[i]

*One way ANOVA, #Significant level < 0.01, [i]Significant level < 0.05
$Values bearing the same letters were not significantly different (Tukey post-hoc analysis)

Table 4. Mean (± SD) of the score of different eating behaviors in healthy students and sufferers from constipation or IBS, and different ethnicities

	Eating behaviors				
	Emotional eating diffuse emotions	Emotional eating clearly labeled emotions	Emotional eating	Restrained eating	External eating
Ethnicity					
Lor, Lak, Bakhtiyari	2.45±0.65 [a$]	2.4±0.5	2.41±0.45	2.54±0.46	2.61±0.51
Persian	2.59±0.58 [a]	2.44±0.42	2.48±0.39	2.53±0.42	2.57±0.54
Kurd	2.36±0.59 [ab]	2.39±0.47	2.37±0.43	2.47±0.46	2.51±0.49
Others (Turk, Arab)	2.18±0.55 [b]	2.37±0.52	2.29±0.39	2.59±0.44	2.59±0.43
P-value*	0.048≠	0.959	0.35	0.78	0.849
Gastrointestinal disorder					
IBS	2.57±0.71	2.48±0.5	2.46±0.4	2.5±0.46	2.58±0.44
Constipation	2.61±0.73	2.37±0.54	2.44±0.51	2.68±0.54	2.57±0.59
Healthy	2.37±0.58	2.39±0.47	2.38±0.43	2.52±0.43	2.58±0.5
P-value*	0.128	0.651	0.629	0.3	0.989

*One way ANOVA. #Significant level <0.05
$Values bearing the same letters were not significantly different (Tukey post-hoc analysis)

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Table 5. Mean (± SD) of daily food group serving intakes (according to Iranian food pyramid) in different ethnicities

Daily food group serving intakes	Ethnicity				P-value*
	Lor, Lak, Bakhtiyari	Persian	Kurd	Others (Turk, Arab)	
Rice	5.56 ± 2.11	5.66 ± 2.25	5.6 ± 2.62	5.29 ± 2.31	0.918
Pasta	0.72 ± 0.72	0.61 ± 0.62	0.86 ± 0.97	0.64 ± 0.91	0.555
Bread	7.65 ± 5.0 [a$]	5.54 ± 3.5 [b]	5.89 ± 4.3 [ab]	7.43 ± 3.5 [ab]	0.046#
Total bread and cereal group	13.97 ± 4.8	11.82 ± 3.7	12.36 ± 4.7	13.36 ± 4.0	0.063
Milk	0.40 ± 0.46	0.46 ± 0.58	0.31 ± 0.44	0.32 ± 0.50	0.554
Yogurt	0.8 ± 0.5 [ab]	0.97 ± 0.59 [a]	0.60 ± 0.43 [b]	0.98 ± 0.66 [a]	0.036#
Doogh	0.83 ± 0.94	0.50 ± 0.51	0.86 ± 0.99	0.86 ± 1.04	0.214
Ice cream	0.37 ± 0.39	0.38 ± 0.46	0.34 ± 0.52	0.30 ± 0.42	0.865
Cheese	0.46 ± 0.61	0.59 ± 0.57	0.40 ± 0.46	0.73 ± 0.72	0.119
Total dairy group	2.89 ± 1.77	2.91 ± 1.55	2.31 ± 1.24	3.22 ± 1.87	0.536
Kinds of meat	2.08 ± 1.26	2.00 ± 1.02	1.86 ± 1.21	2.31 ± 1.24	0.574
Legume	0.43 ± 0.48	0.59 ± 0.44	0.46 ± 0.30	0.39 ± 0.38	0.231
Egg	0.66 ± 0.60	0.71 ± 0.67	0.56 ± 0.42	0.58 ± 0.47	0.693
Total meat and substances group	3.19 ± 1.38	3.31 ± 1.35	2.90 ± 1.40	3.28 ± 1.53	0.662
Fruit	1.14 ± 1.56	2.36 ± 1.23	1.74 ± 1.10	2.27 ± 1.54	0.358
Vegetables	1.6 ±1.26 [ab]	1.5 ± 0.95 [ab]	1.03 ± 0.88 [b]	2.15 ± 1.40 [a]	0.006#
Oils	8.06 ± 2.14	7.64 ± 2.19	7.14 ± 2.49	8.34 ± 2.83	0.189

*One way ANOVA. #Significant level < 0.05
$Values bearing the same letters were not significantly different (Tukey post-hoc analysis)

Discussion

The results of this study indicated significant difference in gastrointestinal disorders between different ethnicities, such that the expected frequency for Kurd students was higher than the other ethnicities. In this way, when food intake was studied in different ethnicities, Kurd students had the lowest intake of the vegetables group. It could be suggested that environmental factors such as life style are more effective than genetic factors.

The results of this research showed that students suffering from IBS consumed less vegetable. In a study performed on medical students in China, lower frequencies of marine foods were observed in students with IBS; however, allergy to marine foods might be the reason for less intake of marine foods (16). In another study of medical students in Korea, there was no significant difference in dietary habits and intake of nutrients (10). The study on Chinese students was focused on different foods intake, and not food materials or food groups, and in the study on Korean students, the relationship between food habits and IBS was the basis of the study. The types of foods were the main difference of the present study with two previous researches so that daily intakes of common foods (from different food groups) were tracked. Using brief instrument in the present study helped to have a rapid and exact access to common foods intake from each food group. Lower vegetable intake in students suffering from IBS could be interpreted as lower intake of insoluble fibers. Insoluble fibers could be fermented in the lower gastrointestinal tract, and resulted in a change in the composition and/or activity of intestinal micro-flora (18). It seems limiting intake of vegetables needs more attention in those who suffer from IBS, and more studies should be done about the recommended daily servings of vegetables in these patients.

In this study, consumption of milk in students suffering from constipation was higher than in others. In another research conducted in Iran on children with constipation, the short-term removal of cow milk from children's diet improved constipation (19). Aydin *et al.* (20) declared that whole milk intake decreased acetylate and deacetylated ghrelin levels compared with the controls who consumed fat free milk. This hormone plays a role in intestinal motility (21), so that research confirmed the effect of fat free milk in reducing the symptoms of constipation. Although the percentage of milk fat was not questioned in our subjects, but it seems that whole milk consumption was more.

In this study, anthropometric measurements were compared between the healthy students and the sufferers from IBS or constipation. The results showed that students with constipation had significantly more weight, BMI, WC, HC and WHR. Two studies in New Zealand and the United States showed two different results; in the first study, there

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was a negative relationship between BMI and the frequency of constipation (22), with the later, a higher frequency of constipation was observed in the obese population as compared with people who had normal weight (23). In this regard, a survey in Iran revealed that women with BMI above 25 suffered more functional constipation, compared with women whose BMI was lower than 25 (24). Our finding can be interpreted in this way that overweight decreases the secretion of ghrelin, the hormone that affects intestinal motility (21, 25).

According to the obtained results, there were no significant differences in the scores of emotional, restrained and external eating behaviors between the students suffering from IBS or constipation and the healthy ones. In this regard, there is a report that some mental and personality disorders may be associated with problems like IBS (26). In this study, the score of emotional eating diffuse emotions was higher in the students with IBS; however, it was not significant. It could be interpreted by the relationship of eating behaviors with personality, psychotic and even environmental factors. Therefore, a focus on these factors could help to clarify the relationship between eating behaviors and gastrointestinal disorders.

Living in dormitories could be considered as a weakness point of this study, since it might affect some habits and dietary behaviors. However, an attempt was made to control this problem by doing the study in October and asking the food intake during the past three months (summer months), while they were at home for the summer holidays.

The findings of this study revealed that some food intakes, overweight and inappropriate anthropometric indices are correlated with IBS or constipation. Therefore, it could be concluded that factors related with these indices such as life style and dietary habits could play an important role in the occurrence of gastrointestinal disorders. Accordingly, the correction of dietary behaviors and life style might be effective in improving the signs of these disorders.

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