Mental, Physical, Dietary, and Nutritional Effects on Irritable Bowel Syndrome in Young Japanese Women

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Abstract

Objective Irritable bowel syndrome (IBS) is a common functional gastrointestinal disorder. The pathogenesis of IBS is multifactorial. The aim of this study was to investigate the prevalence of IBS using the Rome III criteria in young Japanese women and to assess the effects of mental, physical, dietary and nutritional factors on IBS.

Methods In this cross-sectional study, data obtained from self-administered questionnaires, including age, height, weight, lifestyle, food habits, anxiety and depressive states and IBS-related symptoms, were analyzed in 245 participants. An established semiquantitative questionnaire available for clinical investigation (FFQg) was used to obtain a detailed assessment of food intake and the physical activity levels.

Results The prevalence of IBS was 12.0%. Of the IBS participants, constipation-predominant IBS (25.0%) was more prevalent than the diarrhea-predominant subtype (17.9%). The IBS participants had lower body mass indices, consumed less eggs and milk and were more physically active than the non-IBS participants. In addition, an anxiety state was more common in the IBS participants. Those who hesitated with evacuation of stool and who thought that there is an association between abdominal symptoms, such as constipation and diarrhea, and menstruation were more predominant among the IBS participants. The percentage of individuals who reported often rushing to the toilet within the past year and experiencing borborygmus (rumbling stomach) was greater among the IBS participants. A logistic regression analysis revealed that milk intake was an independent predictor of IBS.

Conclusion The prevalence of IBS observed in this study was similar to that reported in previous studies conducted in Japan and other countries. Mental, physical, dietary and nutritional factors have an impact on IBS.

Key words: irritable bowel syndrome, young women, lifestyle, food intake, mental status, physical activity

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Introduction

Irritable bowel syndrome (IBS) is a common functional gastrointestinal disorder characterized by chronic, relapsing abdominal pain or discomfort, abdominal distension and changes in bowel habits without an organic cause (1-3). The prevalence of IBS is reported to be around 10-20% in the general population in many countries, although it varies depending on the diagnostic criteria used (1, 4-10). IBS appears to be more prevalent in women, irrespective of age and ethnic group (1, 4, 6, 8, 11).

Since the symptoms of IBS are nonspecific and subjective, the disease is diagnosed by excluding other organic diseases, such as celiac disease, inflammatory bowel disease, microscopic colitis and cancer. Although IBS symptoms
often impair the health-related quality of life (QOL) (1), many patients with IBS ignore their symptoms and regard them as a normal part of everyday life (12). This is especially true in younger individuals, who tend not to seek medical care (5). Tan et al. reported that only 13.1% of IBS patients consult their healthcare practitioner (4).

The pathogenesis of IBS appears to be multifactorial. Heritability and genetics, dietary/intestinal microbiota, low-grade inflammation and disturbance of the neuroendocrine system of the gut play a central role in the pathogenesis of IBS (12, 13). Brain-gut disorders and psychiatric and social factors have also been recognized to be possible pathologic mechanisms of IBS. Psychiatric factors reported to worsen IBS include anxiety, somatization disorder and depression (3). Comprehensive studies on the associations between the mental, physical, dietary and/or nutritional status and IBS in young Japanese women, however, are few. In the present study, we aimed to investigate the prevalence of IBS in female Japanese university students using the Rome III criteria (1) and to assess lifestyle, mental, physical, dietary and nutritional factors that affect IBS.

Materials and Methods

Study participants

The sample size for young Japanese women was calculated based on an estimated prevalence of 10%, an α-error of 0.025 and a power of 80%. The expected minimal sample size for these outcomes was 199. In the present study, 396 female students from the Faculty of Nursing and Nutrition, University of Nagasaki, Japan were invited to enroll, and 245 students (128 from the Department of Nutrition, 116 from the Department of Nursing and one student from an unknown department) agreed to participate in June 2012. The study participation rate was 61.9%. The women were asked to sign informed consent forms before participating in the study.

Study design

The present study was a cross-sectional study conducted from June through July 2012. The participants completed self-administered questionnaires that included 125 questions regarding personal data, such as age, height, body weight, lifestyle, food habits, anxiety and depressive states and IBS-related symptoms. An established semiquantitative questionnaire available for clinical investigation (a food frequency questionnaire based on food groups, the food frequency questionnaire based on food groups (FFQg) ver. 3.5; Kenpaku-sha, Tokyo, Japan) was used to obtain a detailed assessment of food intake and the physical activity levels (14). The body mass index (BMI) was calculated as body weight (kg) divided by height squared (m²).

Food intake frequency

Data regarding portion size and the frequency of consumption of 29 food groups, including staples (rice, bread and noodles), within one week were calculated using the established semiquantitative questionnaire FFQg ver. 3.5 (Kenpaku-sha). Using these data, the amount of each nutrient and food group determined according to the 2010 edition of the Standard Tables of Food Composition in Japan (15) and the dish category determined according to the Japanese Food Guide Spinning Top (16) was estimated using a computer software program that is based on the standard tables of food composition in Japan 2010 (15) (Table 1). In the Japanese Food Guide Spinning Top, the quantity of each dish category is expressed as “tsu” or SV. SV is

Table 1. List of Nutrients, Food Groups and Dish Categories Estimated from FFQg

<table>
<thead>
<tr>
<th>Classification</th>
<th>Item estimated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrients</strong></td>
<td>total energy; water; protein; total lipids; carbohydrates; ash; sodium; potassium; calcium; magnesium; phosphate; iron; zinc; copper; manganese; retinol; α- and β-carotene; cryptoxanthin; equivalent amount of β-carotene; equivalent amount of retinol; vitamin D; α-, β-, γ- and δ-tocopherol; equivalent amount of tocopherol; vitamin K; vitamins B1, B2, B6, and B12; niacin; folic acid; pantothenic acid; vitamin C; saturated fatty acids; mono-unsaturated fatty acids; polyunsaturated fatty acids; cholesterol; water-soluble fibers; water-insoluble fibers; total fibers; salt; total fatty acids; n-3 and n-6 polyunsaturated fatty acids</td>
</tr>
<tr>
<td><strong>Food groups</strong></td>
<td>cereals (rice, noodle, etc); potatoes and starches; green-yellow vegetables; light-colored and other vegetables; mushrooms; seaweed; beans; fish/shellfish; meats; eggs; milk/dairy products; fruits; snacks; beverages; sugar/sweets; nuts; oils/fats; seasonings/spices</td>
</tr>
<tr>
<td><strong>Dish categories</strong></td>
<td>grain dishes (rice, bread, noodles, and pasta); vegetable dishes; fish and meat dishes (meat, fish, egg, and soy-bean dishes); milk (milk and milk products); fruits; snacks, confection, and beverages</td>
</tr>
</tbody>
</table>

* According to the 2010 edition of Standard Tables of Food Composition in Japan (15)
** According to the Japanese Food Guide Spinning Top (16)

FFQg: food frequency questionnaire based on food groups
Physical activity level

The physical activity level (PAL), calculated as the total energy expenditure (TEE) divided by the basal metabolic rate (BMR), was estimated using a computer software program (FFQg ver. 3.5; Kenpaku-sha) (17). For individuals between 18 to 69 years of age, a PAL of <1.6 was designated as level I, a PAL of 1.6-1.9 was designated as level II and a PAL of >1.9 was designated as level III (18).

Psychological assessment

The Japanese version of the hospital anxiety and depression scale (HADS), a scale proven to be reliable and valid as a screening method for assessing emotional disorders in women (11, 19), was employed to evaluate symptoms of anxiety and depression. The HADS is a self-administered questionnaire that consists of 14 items, seven items for anxiety (HADS-A) and seven items for depression (HADS-D), scored between 0 and 3. A total score of >10 was considered to represent a positive result ("definite"), a score of 8-11 indicates a "probable" result and a score of <8 indicates a negative result for either condition (20).

Definition of IBS

According to the Rome III criteria (1), IBS was diagnosed when the participant had experienced recurrent abdominal pain or discomfort for at least three days per month in the last three months associated with two or more of the following conditions: 1) improvement with defecation, 2) onset associated with a change in frequency of stool and 3) onset associated with a change in form (appearance) of stool. The above criteria must have been fulfilled for the last three months with symptom onset occurring at least six months prior to diagnosis.

Subtype of IBS

Participants diagnosed with IBS were further classified into four subgroups using the Bristol Stool Form Scale (21) as follows: 1) IBS with constipation (IBS-C) defined as hard or lumpy stools ≥25% and loose (mushy) or watery stools <25% of bowel movements, 2) IBS with diarrhea (IBS-D) defined as loose (mushy) or watery stools ≥25% and hard or lumpy stools <25% of bowel movements, 3) mixed IBS (IBS-M) defined as hard or lumpy stools ≥25% and loose (mushy) or watery stools ≥25% of bowel movements, 4) un-subtyped IBS (IBS-U) defined as insufficient abnormalities in stool consistency to meet criteria for IBS-C, D or M (1).

Ethical considerations

This study was performed according to the principles of the Declaration of Helsinki. The study protocol was approved by the Ethical Committee of the University of Nagasaki, and informed consent was obtained from all participants.

Statistical analysis

The data were expressed as the mean ± standard deviation (SD) or the median (range). Differences between groups were tested for statistical significance using Student’s t-test, the chi-square test or Fisher’s exact probability test. A multivariate analysis was performed for variables that were found to be significant in the univariate analyses using a logistic regression analysis. Correlations were examined using a linear regression analysis with coefficients of correlation. All data analyses were performed using the IBM SPSS statistics software program version 20 (IBM Co., Armonk, NY, USA) on a computer with a Windows operating system. A p-value of less than 0.05 was considered to be statistically significant.

Results

Overall characteristics of the 245 participants

The participants ranged in age from 18 to 32 years, with a mean age of 19.8±1.6 years. The mean (±SD) height, body weight and BMI were 1.58±0.05 (m), 51.5±6.6 (kg) and 20.5±2.2 (kg/m²), respectively. The mean (±SD) amount of sleeping hours was 384.4±56.2 minutes. Of these participants, 125 (125/233, 53.6%) lived alone and 26 (26/233, 11.2%) skipped meals (mainly breakfast) almost daily. Only two (2/233, 0.9%) had smoking habits. Food allergies were observed in 17 participants (17/233, 7.3%), including five participants with shellfish allergies, four participants with egg allergies, two participants with buckwheat noodles allergies and one participant with a milk allergy. One hundred and sixty-five participants (165/231, 71.4%) believed there was an association between their abdominal symptoms (such as constipation and diarrhea) and menstruation.

The mean (±SD) intake of total energy, protein, total lipids and carbohydrates per day was 1,655.1±383.8 (kcal), 56.6±16.0 (g), 59.8±18.4 (g) and 214.5±48.2 (g), respectively. The mean (±SD) intake of calcium, iron, total fiber and salt was 462.0±198.5 (mg), 5.9±2.0 (mg), 9.8±3.5 (g), and 7.6±3.3 (g), respectively. With respect to physical activity, the mean (±SD) PAL was 1.69±0.39. Of the 205 participants with available data, 110 (53.6%) were classified as having a PAL level of I, 59 (28.8%) were classified as having a PAL level of II and 36 (17.6%) were classified as having a PAL level of III. Of the 234 participants with available data for a physiological assessment using the HADS, 52 (22.2%) were classified as exhibiting a “definite” anxiety state and 56 (23.9%) were classified as exhibiting a “probable” anxiety state. In addition, 14 (6.0%) participants were classified as exhibiting a “definite” depressive state and 70 (29.9%) were classified as exhibiting a “probable” depressive state.

According to the Rome III criteria (1), 28 participants (28/234, 12.0%) were diagnosed with IBS. Of the 28 par-
participants diagnosed with IBS, seven (25.0%) were diagnosed with IBS-C, five (17.9%) were diagnosed with IBS-D, 13 (46.4%) were diagnosed with IBS-M and three (10.7%) were diagnosed with IBS-U.

**Comparison of the characteristics of the IBS and non-IBS groups**

The IBS participants had lower BMI values; however, there were no statistical differences in age, height or body weight between the IBS and non-IBS groups. Furthermore, lifestyle factors, such as sleeping hours, the interval between rising in the morning and eating breakfast, skipping meals and food allergies were similar between the two groups. However, eight of 16 (50.0%) IBS participants cited anorexia as the reason for skipping meals, whereas this reason was given by only 22 of 117 (18.8%) subjects in the non-IBS group (p=0.005). The prevalence of drinking habits was also similar between the two groups (data not shown). A greater number of individuals who hesitated with evacuation of stool and who thought that there is an association between abdominal symptoms, such as constipation or diarrhea, and menstruation was observed in IBS group than in the non-IBS group.

There were no statistical differences in the consumption of any of the nutrients listed in Table 1 between the two groups (data not shown). Of the food groups and dish categories listed in Table 1, intake of foods in the “eggs in food group” and “milk in dish category” was lower among the IBS participants. Intake of foods in the remaining food groups and dish categories listed in Table 1 was similar between the two groups (data not shown). A possible association between diet and IBS has been previously recognized that their diet has a significant influence on their symptoms, and report specific foods as triggers, most commonly lactose restriction, however, usually fails to improve symptoms, and dietary calcium restriction may be harmful (1). In contrast, prebiotics and probiotics may have potential benefits in treating functional gastrointestinal disorders.

**Independent predictors of irritable bowel syndrome determined according to a logistic regression analysis**

The nine variables found to be significantly different in comparisons between the IBS and non-IBS groups were selected for a logistic regression analysis. These variables included BMI (kg/m²), hesitation with evacuation, abdominal symptoms and menstruation, food group-eggs(g), dish category-milk (SV), PAL-level, an anxiety state evaluated according to the HADS-A, the experience of rushing to the toilet within the past year and borborygmus (rumbling stomach). Consequently, the “milk in dish category” was found to be an independent predictor of IBS (Table 3).

**Discussion**

In the present study, the prevalence of IBS among young Japanese women (12.0%) was very similar to that reported in previous studies conducted in Japan (5, 7) and other countries (1, 4, 8-10), although the diagnostic criteria differed across the studies. In addition, the constipation-predominant subtype (IBS-C) was more prevalent (25.0%) than the diarrhea-predominant subtype (IBS-D) (17.9%), as reported in previous studies of women (5, 7). It is common for IBS patients to switch from one subtype to another over time (12), and in women, worsening of IBS symptoms during menstruation may obscure the diagnosis (22). In the present study, 71.4% of the participants believed that there is an association between abdominal symptoms (such as constipation and diarrhea) and menstruation.

Among the participants evaluated in this study, the mean intake of total energy, carbohydrates, calcium, iron and total fiber per day was lower than the estimated average requirements, recommended dietary allowance and tentative dietary goals for preventing lifestyle-related diseases recommended in the 2010 version of the Dietary Reference Intakes for Japanese (18). In contrast, the mean intake of protein and salt was higher than the recommendations (18). Although BMI was lower in the IBS group than in the non-IBS group, intake of these nutrients was similar between the two groups. Of note, intake of foods in the “eggs” in food group was significantly lower in the IBS group. Furthermore, the IBS participants consumed lower amounts of foods in the “milk” in dish category in the present study. A possible association between diet and IBS has been previously reported (8). Okami et al. reported that a female IBS group ate less fish, fruit, milk and green-yellow vegetables and more processed food products than a non-IBS group (11). In a separate study, Chirila et al. reported that, among a general urban population in Romania, IBS subjects more frequently consumed canned food, processed meat, beef, milk, pulses, cereals or grain bread/pasta, cafeteria products, fruit compotes and herb teas (8). In addition, Kumeta et al. reported that the “traditional Japanese” dietary pattern of high loading of miso soup, tofu, rice and natto had an effect on the prevention or prophylaxis of IBS in a rural area of a northern Japanese population (7). Many IBS patients recognize that their diet has a significant influence on their symptoms and report specific foods as triggers, most commonly implicating milk and dairy products followed by carbohydrates and fatty foods, caffeine, alcohol and spices (7, 12). Lactose restriction, however, usually fails to improve symptoms, and dietary calcium restriction may be harmful (1). In contrast, prebiotics and probiotics may have potential benefits in treating functional gastrointestinal disorders.
Table 2. Comparison of Main Characteristics between IBS Group and Non-IBS Group

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>IBS group (n=28)</th>
<th>non-IBS group (n=206)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>19.7 ± 1.3</td>
<td>19.8 ± 1.6</td>
<td>0.738</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>158.8 ± 5.6</td>
<td>158.3 ± 5.5</td>
<td>0.627</td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>49.6 ± 5.3</td>
<td>51.8 ± 6.7</td>
<td>0.129</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>19.7 ± 1.6</td>
<td>20.6 ± 2.3</td>
<td>0.043</td>
</tr>
<tr>
<td>Sleeping hours (min)</td>
<td>384.9 ± 78.9</td>
<td>384.2 ± 52.7</td>
<td>0.879</td>
</tr>
<tr>
<td>Time from rising to breakfast (min)</td>
<td>25.2 ± 16.1</td>
<td>34.6 ± 35.6</td>
<td>0.188</td>
</tr>
<tr>
<td>Skipping meals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usually</td>
<td>3</td>
<td>23</td>
<td>1.000</td>
</tr>
<tr>
<td>Occasionally</td>
<td>13</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>12</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>Food allergy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>2</td>
<td>15</td>
<td>1.000</td>
</tr>
<tr>
<td>Absent</td>
<td>26</td>
<td>190</td>
<td></td>
</tr>
<tr>
<td>Hesitation with evacuation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usually</td>
<td>2</td>
<td>8</td>
<td>0.034</td>
</tr>
<tr>
<td>Occasionally</td>
<td>14</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>12</td>
<td>138</td>
<td></td>
</tr>
<tr>
<td>Abdominal symptoms and menstruation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associated</td>
<td>26</td>
<td>139</td>
<td>0.007</td>
</tr>
<tr>
<td>Not associated</td>
<td>2</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>Food group-Eggs (g)*</td>
<td>25.1 ± 14.7</td>
<td>34.9 ± 18.0</td>
<td>0.007</td>
</tr>
<tr>
<td>Dish category-Milk (SV)**</td>
<td>0.9 ± 1.0</td>
<td>1.6 ± 1.6</td>
<td>0.036</td>
</tr>
<tr>
<td>PAL</td>
<td>1.8 ± 0.5</td>
<td>1.7 ± 0.4</td>
<td>0.091</td>
</tr>
<tr>
<td>PAL- Level I</td>
<td>12</td>
<td>98</td>
<td>0.015</td>
</tr>
<tr>
<td>Level II</td>
<td>3</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Level III</td>
<td>9</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Anxiety state</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definite</td>
<td>9</td>
<td>43</td>
<td>0.049</td>
</tr>
<tr>
<td>Probable</td>
<td>10</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>9</td>
<td>117</td>
<td></td>
</tr>
<tr>
<td>Depressive state</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definite</td>
<td>2</td>
<td>12</td>
<td>0.838</td>
</tr>
<tr>
<td>Probable</td>
<td>9</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>17</td>
<td>133</td>
<td></td>
</tr>
<tr>
<td>Experience of rushing to a toilet within the past year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Often</td>
<td>8</td>
<td>21</td>
<td>0.001</td>
</tr>
<tr>
<td>Sometimes</td>
<td>18</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>2</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td>Abdominal distension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>17</td>
<td>86</td>
<td>0.067</td>
</tr>
<tr>
<td>Absent</td>
<td>11</td>
<td>117</td>
<td></td>
</tr>
<tr>
<td>Borborygmus (rumbling stomach)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>22</td>
<td>98</td>
<td>0.003</td>
</tr>
<tr>
<td>Absent</td>
<td>6</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>Coping with abnormal bowel movements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trying</td>
<td>16</td>
<td>94</td>
<td>0.252</td>
</tr>
<tr>
<td>Not trying</td>
<td>12</td>
<td>112</td>
<td></td>
</tr>
</tbody>
</table>

Data were expressed as mean ± SD, or the number of participants.

*According to the 2010 edition of Standard Tables of Food Composition in Japan (15)

**According to the Japanese Food Guide Spinning Top. SV (serving) is a simply countable number describing the approximate amount of each dish or food served to one person in Japan (16).

IBS: irritable bowel syndrome, SD: standard deviation, BMI: body mass index, PAL: physical activity level

(FGD) (23), and water-soluble fiber intake, which has an impact on intestinal flora, has been reported to be effective in improving IBS symptoms (12). Therefore, the role of diet in IBS remains uncertain and inadequately studied (24). The IBS participants in the present study may have avoided “eggs” or “milk” because these foods were recognized to be “triggers”.

Daily exercise can maintain a good bowel function and help to prevent constipation (7). Lustyk et al. reported that physically active women were less likely to report a feeling of incomplete evacuation following a bowel movement than inactive women (25). Okami et al. reported that an IBS group exercised less than a non-IBS group among Japanese nursing and medical school students (11). In the present study, however, the IBS participants were more physically active than the non-IBS participants based on the PAL levels. The reason for this discrepancy between our results and those of previous studies is unclear; however, the IBS participants in the present study may have been trying to improve their symptoms with daily exercise.

An anxiety state, as assessed using the HADS-A, was more common in the IBS group than in the non-IBS group.
in the present study. Worry and stress have been reported to be associated with IBS symptoms (3), and treatment of associated anxiety and depression often improves bowel and other symptoms (2). Psychological stress can result in intestinal symptoms by producing changes in the intestinal function mediated by the autonomic nervous system, hypothalamic-pituitary-adrenal axis and/or immune system (26). Increasing sympathetic nervous system activity can increase colonic sensitivity to balloon distension. Heitkemper et al. reported that the systemic sympathovagal balance was shifted to a significantly lower vagal tone in female patients with IBS (27). In addition, disordered regulation of 5-hydroxytryptamine (5-TH, serotonin) can induce changes in gastrointestinal motility, sensation and an imbalance in absorption and secretion, which can lead to abdominal pain and discomfort (2, 3). In fact, IBS patients are more likely to be psychiatrically ill than the general population (12). Psychiatric disorders include panic disorder, generalized anxiety disorder, mood disorders, depression and post-traumatic stress disorder (1, 28). Although there is currently no convincing evidence that psychological factors play a role in the onset and/or progression of IBS (2, 12), in cases of anxiety disorders, hyperactivity of neurotransmitters, such as serotonin, may cause abdominal susceptibility or motility disorders in the gastrointestinal system (brain-gut interactions) (3, 26, 28).

There are limitations worth noting in the present study. First, the current study was a cross-sectional study, which can reveal only associations and not causality between the studied elements (8). Second, the participants in the present study were restricted to single female university students in a rural area of the southwestern part of Japan and may not be representative of the general population of young Japanese women. Third, the sample size in the present study was relatively small. However, the prevalence of IBS in young Japanese women diagnosed based on the Rome III criteria (1) and, lifestyle, mental, physical, dietary and nutritional factors that influence IBS were disclosed. It is noted that a logistic regression analysis showed that “milk in dish category” was an independent predictor of IBS. The role of diet in IBS remains uncertain and further studies are needed.

The authors state that they have no Conflict of Interest (COI).

### Table 3. Independent Predictors of Irritable Bowel Syndrome by Logistic Regression Analysis

<table>
<thead>
<tr>
<th>Variables多数</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>p</th>
<th>Adjusted odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dish category-Milk (SV)*</td>
<td>-0.591</td>
<td>0.280</td>
<td>0.035</td>
<td>0.554</td>
<td>0.320-0.959</td>
</tr>
</tbody>
</table>

CI: confidence interval

*According to the Japanese Food Guide Spinning Top. SV (serving) is a simply countable number describing the approximated amount of each dish or food served to one person in Japan (16).

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