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Dietary and Lifestyle Factors Associated with Irritable Bowel Syndrome among Egyptian Medical Students: A Multicenter Cross- Sectional Study

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Abstract

Background

Irritable Bowel Syndrome (IBS) is a multifactorial gastrointestinal disorder affected by diet and lifestyle factors. The body of evidence indicates an increased prevalence worldwide especially among medical students. However, there is a research gap regarding the prevalence and associated factors of IBS among medical students in Egypt. This study aimed to investigate the prevalence and associated factors of IBS among Egyptian medical students.

Methods

This study was a multi-center cross-sectional study involving 5883 Egyptian medical students who completed a validated self-administered questionnaire assessing socio-demographic data, dietary habits, sleep patterns, and the Rome IV criteria for IBS. The study used a binary logistic regression model to identify factor most probably associated with IBS, estimated as odds ratios (ORs) with 95% confidence intervals (CIs).

Results

The study included 5883 medical students. 54.7% of them were 21–24 years old while the rest were 17-<21 years. 57.1% of them were females and 53.8% were senior students or interns. The prevalence of IBS was 39.9%. The binary logistic regression model identified independent associations between IBS and female sex, frequent consumption of fast food, sugar-sweetened beverages, and desserts. In addition, food intolerance, medication use, inadequate daily hydration, and an irregular sleep pattern were independently associated with higher odds of IBS.

Conclusion

The present study identified several dietary and lifestyle factors independently associated with IBS. These findings may help inform future health-promotion interventions. Prospective longitudinal studies are required to establish causality.

Introduction

Irritable bowel syndrome (IBS) is a chronic gastrointestinal functional disorder. It usually manifests with recurrent abdominal cramps, distention, and altered bowel habits as diarrhea, constipation, or both alternating [1].

IBS differs from other gastrointestinal disorders IBS in that it has no diagnostic tests; instead, it is diagnosed based on the presenting clinical manifestations after exclusion of other warning diagnoses [2]. The mainstay for diagnosing IBS is the ROME III and IV tools [3]. According to Rome III and IV, approximately 10.1% and 4.1% of the population worldwide are suffering from IBS respectively [4]. According to Rome IV, IBS has four main subtypes based on the predominant form of stool: IBS with constipation (IBS-C), IBS with diarrhea (IBS-D), IBS with mixed bowel habits (IBS-M), and unclassified IBS (IBS-U) [3].

It has been widely recognized that IBS symptoms have a significant negative effect on the patients' quality of life. Moreover, it leads to loss of savings, socializing, and the ability to travel [5, 6].

The exact etiology of IBS is still under investigation with multiple pathophysiological factors have been suggested. These include malfunction in the gut-brain axis, genetic predisposition, infection, psychosocial factors, intestinal dysmotility, low-grade mucosal inflammation, and food allergies and intolerances [7].

The body of evidence suggests that fast food is a main factor behind the increase in nutrition-related diseases including obesity, hypertension, diabetes, and cancers. In addition, recent literature has showed that the occurrence of IBS has been associated with the increased consumption of fast-food recently [8, 9].

Fast foods refer to ' out of home' or ' takeaway' foods that can be obtained from several sources including vending machines, fast food outlets, coffee shops, schools, and so on. Fast foods are typically highly processed and precooked or frozen with many artificial preservatives as well as high amounts of sodium, cholesterol, saturated fats, refined carbohydrates and sugars. Its consumption has increased greatly over the last decades. The changes in the type and habits of nutrition of this age are greatly affected by socioeconomic, cultural, environmental, demographic, and psychographic factors [10-12].

Unlike other university students, medical students experience unique challenges. They frequently suffer from high levels of stress, prolonged study periods, heavy workloads, sleep deprivation, increased fast-food intake, and difficulties related to their social lives [13].

Like other medical students, Egyptian medical students lead difficult lives as they struggle to understand a challenging curriculum in a language that is not their first language and deal with the cost of their education. These factors create a unique setting that may affect the prevalence of IBS within this population, highlighting the importance of this study in understanding and addressing the risk factors in such a challenging environment [14].

Study Objectives:

General objective

Investigate the prevalence of IBS among medical students in Egypt and assess its association with dietary and lifestyle factors.

Specific objectives

- Estimate the prevalence of IBS among Egyptian medical students recruited from multiple universities across different regions of Egypt
- Identify the dietary habits of the Egyptian medical students.
- Identify dietary factors associated with IBS.
- Identify other factors that might contribute to the occurrence of IBS.

Methods

Study design and setting

An observational cross sectional study design was selected to achieve the objectives of the study. This study was a multi-center study where Egyptian medical students from 28 different universities were included.

Participants

The study included medical students from the first to the fifth year, from 28 different Egyptian Universities.

The minimum required sample size was calculated using Epi Info™ version 7 assuming an expected prevalence of irritable bowel syndrome (IBS) among medical students of 31.7% [15], a confidence level of 95%, a margin of error of 2%, and a design effect of 1.5 to account for the multicenter nature of the study, the minimum required sample size was estimated at approximately 3,276 participants. The final sample included 5,883 eligible medical students from 28 Egyptian universities, exceeding the minimum required sample size and thereby increasing the precision of the estimates.

A non-probability convenience sampling strategy was used. Student collaborators distributed the survey link through university social media groups.

Exclusion criteria:

- Participants with organic gastrointestinal diseases or complaining of any alarming manifestations as rapid weight loss, and bloody stools.
- Participants with history of gastrointestinal surgery.

Data collection tool:

An online questionnaire created using Google Forms, and based on validated indices, was utilized. The questionnaire was administered in English, which is the language of medical education in Egyptian medical schools. It included four sections to assess the following:

First section: Students' demographic characteristics including: gender, age, marital status, region, academic year, and means by which the questionnaire received.

Second section: the presence of alarming manifestations, history of gastrointestinal surgery, medication use, presence of food intolerance, water consumption during the day and the sleeping pattern.

Third section: Fast food consumption using The Starting the Conversation (STC) Questionnaire [16] which is a validated tool that assesses the dietary habits and measures frequency of fast-food consumption. It is an eight-item questionnaire. Each item offers three response options, scored as follows: the most healthful dietary practices score 0, less healthful practices score 1, and the least healthful practices score 2. The total score, ranging from 0 to 16, is obtained by summing the scores of all items. Lower scores indicate a more healthful diet, while higher scores suggest greater room for dietary improvement.

Fourth section: IBS criteria using The Rome IV Diagnostic Questionnaire for IBS [17] which is designed to diagnose irritable bowel syndrome by assessing five key symptoms which are recurrent abdominal pain at least 1 day per week during the past 3 months, the relationship of pain to defecation, changes in stool frequency, changes in stool form, and the presence of these manifestation for at least 6 months.

Diagnosis of IBS:

IBS diagnosis was based on the presence of recurrent abdominal pain/ discomfort for at least one day per week during the past three months, persisting for at least six months, with two or more of the following: (i) the relation of pain to defecation, (ii) a change in stool frequency, and (iii) a change in stool appearance. The Rome IV Criteria for IBS diagnosis have a specificity of 97.1% and a sensitivity of 62.7% [18].

Data collection method:

Data was collected through an online link to the web-based questionnaire that was developed using the "Google Forms" platform to obtain data. Collaborators from the different universities were responsible for the distribution of the online questionnaire via online platforms and social media (Twitter, Facebook, LinkedIn, and Instagram) that are accessible through smartphones, laptops, and computers.

Statistical analysis:

Statistical analysis was carried out using SPSS (Statistical Package for the Social Sciences) (version 25.0, IBM, New York, USA). General characteristics were presented using descriptive statistics, including numbers and percentages. Group comparisons were assessed using Pearson Chi Square test.

Continuous variables were evaluated using Mann Whitney test, wherein findings were displayed using median and Inter-Quartile Range (IQR). Binary logistic regression analysis was conducted to identify independent associations with IBS in comparison to the group without IBS. The findings were reported as odds ratios (OR) with corresponding 95% confidence intervals (CI). All p-values reported in the study were calculated using a two-tailed test, and statistical significance was determined as $p<0.05$.

Ethical approval:

The study was approved by the Research Ethics Committee of the Faculty of Medicine, Alexandria University (Approval No. 180/9-26/11/2024, ethical approval no.0306853). All participants provided informed electronic consent before participation. The study was performed in accordance with Helsinki declaration.

Participants' consent:

The introduction to the questionnaire used in this study included an explanation of the purpose of the study. It also included an informed consent to participate emphasizing the respondent's anonymity and confidentiality.

Results

The total participants were 5883 medical students/ interns with a median age of 21.0 years (IQR 19.0-22.0). 54.7% of them were in the age category of 21-24 years. Slightly more than half the participants were females (57.1%). Furthermore, the great majority of them were single (98.2%) and 53.8% of them were seniors.

The prevalence of Irritable Bowel Syndrome (IBS) in the studied population was 39.9%. Those aged 21-24 years showed a significantly higher prevalence (42.7%) compared to those aged 17-20 years (36.7%). The female participants showed a significantly higher prevalence (45.4%) compared to their male counterparts (32.7%). Also, senior students exhibited a significantly higher prevalence (42.2%) compared to junior students (37.3%) as shown in table 1.

Table 2 shows that presence of food intolerance was significantly associated with higher prevalence of IBS (65.9%) compared to absence of food intolerances (35.9%). Most of food intolerances reported were intolerances for lactose, gluten containing meals, legumes and sea foods. Similarly, usage of medications was significantly associated with higher prevalence of IBS (55.3%) compared to non-usage (35.9%). Most of the medications used were analgesics and medications for thyroid disorders and allergic conditions. However, medication use was assessed as a single variable regardless of medication type.

Consumption of 2 or more liters of water per day was significantly associated with lower prevalence of IBS (38.1%) compared to consumption of less than 2 (46.4%). Also, regular sleep pattern was significantly associated with lower prevalence of IBS (33.3%) compared to interrupted sleep (45.9%).

Table 3 shows that Participants who consumed fast food 4times or more per week showed a significantly higher prevalence of IBS (47.5%) compared to those who consumed it 2 times/ week (41.3%) or less than once (35.0%). Moreover, consumption of 5 or more servings of fruits and vegetables per day was significantly associated with lower prevalence of IBS (35.8 and 37.2% respectively) compared to consumption of 2 or less of both (41.5 and 41.6 respectively). Consumption of soda/ sweetened drinks 3 times or more/day was significantly associated with higher prevalence of IBS (45.3%) compared to their consumption once or twice a day or even less (39.0 and 39.1% respectively). Also, consumption of non-low fat snack chips/ crackers 4 times or more per week shows a significantly high association with IBS (45.9%) in comparison with their consumption 2-3 times or once or less per week (40.7% and 36.1% respectively). The same applies for non-low fat desserts and sweets' consumption where 4times per week showed a significantly higher prevalence of IBS than 2-3 or once or less per week (45.8% compared to 41.1% and 36.2% respectively). Participants who used a lot of fat in their food showed a higher prevalence than those who used very little or some amounts (44.4% compared to 36.8% and 40.8% respectively).

Table 4 illustrates the scores of the STC eight items as well as the summary score for all cases and split by presence or absence of IBS. As shown in the table, the mean± SD, median and IQR show a significant difference between IBS and non-IBS participants for all item expect for protein consumption. The min-max score for all items is 0-2. The min-max score for the summary score is 0-16.

Table 5 illustrates the binary logistic regression model for risk factors associated with occurrence of IBS. The model was statistically significant where $\boldsymbol{X^2}$ = 605.277, p <0.001*. It was proved to be fitting by Hosmer-Lemeshow test where p = 0.575.

The model shows that:

- Age showed a marginally non-significant association with IBS, where participants aged 17-20 years had lower odds of having IBS compared to their older counterparts (odds ratio [OR]=0.884, 95% CI: 0.70-1.12).
- Female participants had significantly higher odds of IBS compared to males (OR= 1.78, 95% CI: 1.58-2.00, *P*<0.00).
- Fast food consumption 4 times or more per week showed significantly 49% higher odds of IBS than its consumption less than once per week (OR= 1.49, 95% CI: 1.25-1.77, ***P*<0.00**). Similarly, 1-3 times per week consumption showed significantly 24% higher odds than less than once per week (OR= 1.24, 95% CI: 1.09-1.40, *P*=0.001).
- Drinking soda or sweetened drinks 3 or more times per day showed 20% higher odds of IBS than their consumption less than once (OR= 1.20, 95% CI: 1.01-1.41, *P*=0.033).
- Consumption of non-low fat desserts and sweets 4 or more per week showed significantly 22% higher odds of IBS than their consumption less than once per week (OR= 1.22, 95% CI: 1.03-1.45**,** *P*=0.021). Also, 1-3 times per week consumption showed significantly 13% higher odds than less than once per week (OR= 1.13, 95% CI: 1.01-1.28, *P*=0.045).

- Presence of food intolerance had significantly 81% higher odds of IBS compared to absence of food intolerance (OR= 1.81, 95% CI: 1.58- 2.07, *P*<0.001).
- Self-reported medication use was independently associated with higher odds of IBS (OR= 2.96, 95% CI: 2.51-3.49, *P*<0.001). However, because medication use was recorded as a single variable without distinguishing medication classes or treatment indications, this association should be interpreted cautiously.
- Water consumption of less than 2 liters per day had significantly 15% higher odds of IBS than consumption of more than 2 liters (OR= 1.15, 95% CI: 1.01-1.31, *P*=0.045).
- Interrupted sleep pattern showed significantly 58% higher odds of IBS than regular sleep (OR= 1.58, 95% CI: 1.42-1.77, *P*<0.001).

The binary logistic regression model demonstrated an overall classification accuracy of 66.3%. The model showed a sensitivity of 36.9% and a specificity of 85.9%. The Cox and Snell R^2 and Nagelkerke R^2 values were 0.095 and 0.129, respectively, indicating that the included variables explained approximately 9.5%–12.9% of the variation in IBS status. The model was statistically significant (Omnibus test: χ^2 = 589.602, df = 19, p < 0.001). Furthermore, the Hosmer–Lemeshow goodness-of-fit test was non-significant (χ^2 = 5.663, df = 8, p = 0.685), indicating adequate model fit.

Discussion

IBS is a chronic disorder of gut–brain interaction characterized by recurrent abdominal pain associated with altered bowel habits in the absence of identifiable structural pathology. The present multicenter study used the Starting the Conversation (STC) dietary assessment tool and the Rome IV criteria to assess the prevalence of IBS and identify dietary and lifestyle factors associated with the condition among Egyptian medical students.

The study demonstrated a high prevalence of IBS (39.9%) among Egyptian medical students. This estimate exceeds the prevalence reported in the general population using the Rome IV criteria, which ranges from 4.1% to 10.1% [4]. However, it is consistent with evidence suggesting that medical students constitute a particularly vulnerable population because of academic demands, psychological stress, irregular eating habits, and sleep disturbances. A systematic review published in 2015 reported IBS prevalence rates among medical students ranging from 9.3% to 35.5% [19]. The higher prevalence observed in the present study may reflect the combined influence of these factors within the Egyptian medical education context and highlights the need for targeted preventive and supportive interventions.

Female students exhibited a higher prevalence of IBS than males, consistent with previous findings reported by Mahyoub et al. in Yemen 2024 [20]. Several mechanisms may explain this difference, including the influence of sex hormones on gastrointestinal motility and visceral sensitivity, as well as differences in stress perception and healthcare-seeking behavior. Although senior students initially appeared to have a higher prevalence of IBS, academic year was not independently associated with IBS

after adjustment for other covariates. This finding suggests that the observed differences may be attributable to accompanying lifestyle and dietary factors rather than academic seniority itself.

Dietary habits emerged as important correlates of IBS in the present study. Frequent fast-food consumption was independently associated with higher odds of IBS, supporting previous evidence linking ultra-processed foods to functional gastrointestinal disorders [21]. Fast foods are typically rich in saturated fats, additives, and refined carbohydrates, all of which may influence intestinal permeability, gut microbiota composition, and inflammatory pathways that contribute to gastrointestinal symptoms.

Similarly, frequent consumption of sugar-sweetened beverages was associated with IBS. Excess intake of simple sugars may increase intestinal fermentation, gas production, and osmotic effects within the gastrointestinal tract, potentially aggravating symptoms in susceptible individuals. These findings support previous observations regarding the contribution of sugary beverages to gastrointestinal discomfort [22].

The inverse relationship observed between fruit and vegetable consumption and IBS prevalence further supports the importance of overall dietary quality. Fruits and vegetables provide dietary fiber and bioactive compounds that may promote gut health. Nevertheless, the relationship between fiber intake and IBS remains complex because some fermentable fibers may exacerbate symptoms in certain individuals. This observation is consistent with the conclusions of Eswaran et al. [23], who emphasized the importance of individualized dietary recommendations for IBS patients.

Frequent consumption of non-low-fat desserts was also independently associated with IBS. High-fat foods may alter gastrointestinal motility, delay gastric emptying, and increase visceral hypersensitivity, thereby contributing to symptom generation in susceptible individuals [24]. This finding further supports the potential role of unhealthy dietary patterns in the development or exacerbation of IBS symptoms.

Although frequent fast-food consumption, sugar-sweetened beverages, unhealthy snacks, and lower water intake were independently associated with IBS, these findings should be interpreted cautiously because of the cross-sectional design. Reverse causation cannot be excluded, as individuals experiencing gastrointestinal symptoms may modify their dietary habits after symptom onset. For example, some participants may intentionally reduce fast-food intake, increase water consumption, or avoid specific foods perceived to trigger symptoms. Consequently, the observed associations do not establish the temporal sequence between dietary behaviors and IBS. Prospective longitudinal studies are needed to clarify whether these dietary patterns contribute to the development of IBS or represent behavioral changes following symptom onset.

Lifestyle factors were also important. Lower water intake was associated with increased odds of IBS. Adequate hydration contributes to normal bowel function and may be particularly relevant for constipation-predominant IBS, where insufficient fluid intake may aggravate symptoms.

Sleep disturbance emerged as one of the strongest lifestyle-related factors associated with IBS. Increasing evidence supports a bidirectional relationship between sleep quality and gastrointestinal function through the gut–brain axis. Poor sleep may alter pain perception, increase stress responsiveness, and exacerbate gastrointestinal symptoms, whereas IBS symptoms themselves may impair sleep quality [20,25].

Participants reporting food intolerance were significantly more likely to have IBS. Previous studies have shown that foods containing lactose, gluten, and certain fermentable carbohydrates may trigger symptoms in susceptible individuals [26]. However, because of the cross-sectional design, the temporal relationship cannot be established. Individuals with IBS may become more attentive to symptom-provoking foods and therefore be more likely to report food intolerance. Consequently, reverse causation cannot be excluded, and longitudinal studies are needed to clarify the direction of this association.

Medication use demonstrated the strongest association with IBS in the present study. However, this finding should be interpreted with caution because medication use was assessed as a broad binary variable without distinguishing between medication classes or the medical conditions for which they were prescribed. Consequently, medication use may represent a proxy for underlying health status rather than an independent causal factor. Furthermore, reverse causation cannot be excluded, as participants experiencing gastrointestinal symptoms may have been more likely to use medications. Similar findings have been reported among Egyptian medical students by Elsharawy et al. [15]. Because medication use was assessed as a broad category, future studies should investigate the contribution of specific medication classes to IBS risk.

Strengths and limitations:

The present study has several strengths. First, it included a large sample of 5,883 medical students, which enhanced the statistical power and precision of the estimates. Second, participants were recruited from 28 universities across different regions of Egypt, increasing the geographical coverage and diversity of the study population. Third, the study utilized validated instruments, namely the Rome IV Diagnostic Questionnaire for IBS and the Starting the Conversation (STC) dietary assessment tool, which strengthened the reliability of the collected data. Finally, the inclusion of multiple dietary, lifestyle, and demographic variables allowed for a comprehensive assessment of factors independently associated with IBS.

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design precludes establishing causal relationships between the identified factors and IBS. In addition, reverse causation cannot be excluded, as participants with IBS may have modified their dietary habits or hydration practices in response to gastrointestinal symptoms before completing the survey. Second, participants were recruited through an online questionnaire distributed via social media platforms using student collaborators, which constitutes a convenience sampling approach.

Consequently, the study may be subject to selection bias, as students who were more interested in health-related topics or experiencing gastrointestinal symptoms may have been more likely to participate. In addition, because the questionnaire was disseminated through multiple social media channels, the total number of students who received the survey invitation could not be determined; therefore, a response rate could not be calculated. These factors may limit the generalizability of the findings to all Egyptian medical students. Moreover, dietary habits, food intolerance, medication use, and other variables were self-reported and may be subject to recall bias and reporting bias. Finally, Medication use was assessed as a single self-reported binary variable without information regarding medication class, duration, dose, frequency, or indication. Consequently, the observed association may reflect confounding by underlying medical conditions rather than a direct effect of medication use itself.

Conclusion

The present study identified several dietary and lifestyle factors that were independently associated with IBS among Egyptian medical students. Because of the cross-sectional design, causal relationships cannot be inferred. Nevertheless, the findings highlight potentially modifiable behaviors that warrant further investigation in prospective studies and may help inform future health-promotion interventions.

Declarations

Ethics approval and consent to participate

The study was approved by the Research Ethics Committee of the Faculty of Medicine, Alexandria University (Approval No. 180/9-26/11/2024, ethical approval no.0306853). The study was conducted in accordance with the principles of the Declaration of Helsinki. Electronic informed consent was obtained from all participants before completing the online questionnaire. Participation was voluntary, and anonymity and confidentiality of the collected data were ensured.

Consent for publication

Not applicable since no individual patient data or images are included.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Eman Hamdy Darweesh conceived and designed the study, supervised the project, performed the statistical analysis, interpreted the data, and drafted the manuscript.

Mai Adel Shalaby contributed to the study design, interpretation of the findings, and critically revised the manuscript for important intellectual content.

Mohamed Yasser Abdelrazik coordinated data collection at participating universities, assisted with questionnaire distribution, contributed to data management, and assisted in manuscript preparation.

Asmaa Hesham Abdallah coordinated data collection at participating universities, assisted with questionnaire distribution, contributed to data management, and assisted in manuscript preparation.

Ahmed Reda Ahmed coordinated data collection at participating universities, assisted with questionnaire distribution, contributed to data management, and assisted in manuscript preparation.

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All authors read and approved the final manuscript.

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Authors’ contribution:

- Eman Hamdy Darwish conducted the statistical analysis and shard in writing the manuscript.
- Mai Adel Ahmed Shalaby shard in writing the manuscript.
- The rest of the authors shared in data collected and writing the manuscript.
- All authors shared in revising this manuscript.

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Tables

Table 1: Distribution of the studied participants according to their general characteristics as well as presence or absence of IBS (n= 5883)

	Overall (5883)		IBS 2350 (39.9%)		Non-IBS 3533 (60.1%)		*p*- value	Test of significance
	No.	**%**	**No.**	**%**	**No.**	**%**		
Age (years)							*P<0.001**	Mann Whitney U
Median	21.00		21.00		21.00			U= 3817347.00
IQR	19.00- 22.00		20.00-23.00		19.00-22.00			
Min-max	17.00-24.00		17.00-24.00		17.00-24.00			
Age categories (years)								
17-<21	2667	45.3	978	36.7	1689	63.3	*P<0.001**	Chi Square
21-24	3216	54.7	1372	42.7	1844	57.3		X^2 =21.815
Sex								
Male	2525	42.9	825	32.7	1700	67.3	*P<0.001**	Chi Square
Female	3358	57.1	1525	45.4	1833	54.6		X^2 =97.525
Marital status								
Single	5775	98.2	2306	39.9	3469	60.1	P= 0.0865	Chi Square
Married	108	1.8	44	40.7	64	59.3		X^2 =0.029
Academic year								
Junior (1, 2, 3)	2716	46.2	1014	37.3	1702	62.7	*P<0.001**	Chi Square
Senior (4,5, interns)	3167	53.8	1336	42.2	1831	57.8		X^2 =14.341

IQR: Inter-Quartile Range

The (*) signify statistically significant results, typically with a p-value less than 0.05

Table 2: Distribution of the studied participants according to presence of food intolerance, usage of medications, water consumption per day and sleep pattern in the past 4 months as well as presence or absence of IBS (n= 5883)

	Overall (5883)		IBS (2350) (39.9%)		Non-IBS (3533) (60.1%)		*p*- value	Test of significance
	No.	%	No.	%	No.	%		
Presence of food intolerance								
Yes	786	13.4	518	65.9	268	34.1	*P<0.001**	Chi Square
No	5097	86.6	1832	35.9	3265	64.1		X^2 = 254.815
Usage of medications								
Yes	1226	20.8	678	55.3	548	44.7	*P<0.001**	Chi Square
No	4657	79.2	1672	35.9	2985	64.1		X^2 = 152.243
Water consumption per day								
< 2 liters	1294	22.0	600	46.4	694	53.6	*P<0.001**	Chi Square
≥ 2 liters	4589	78.0	1750	38.1	2839	61.9		X^2 = 97.532
The usual sleep pattern								
Regular	2797	47.5	932	33.3	1865	66.7	*P<0.001**	Chi Square
Interrupted	3086	52.5	1418	45.9	1668	54.1		X^2 = 28.552

The (*) signify statistically significant results, typically with a p-value less than 0.05

Table 3: Distribution of the studied participants according to their dietary habits in the past 4 months and presence or absence of IBS (n= 5883)

	Overall (n= 5883)		IBS (n=2350) (39.9%)		Non-IBS (n= 3533) (60.1%)		*p*- value	Test of significance
	No.	**%**	**No.**	**%**	**No.**	**%**		
How many times a week did you eat fast food meals/snacks?								
<1 time/ week	2152	36.6	753	35.0	1399	65.0	*P<0.001**	Chi Square X^2 =46.069
1-3times	2816	47.8	1162	41.3	1654	58.7		
≥4 times	915	15.6	435	47.5	480	52.5		
How many servings of fruits did you eat each day?								
≥5 times	279	4.7	100	35.8	179	64.2	*P=0.001**	Chi Square X^2 = 14.084
3-4	1387	23.6	502	36.2	885	63.8		
≤2	4217	71.7	1748	41.5	2469	58.5		
How many servings of vegetables did you eat each day?								
≥5 times	298	5.1	111	37.2	187	62.8	*P= 0.001**	Chi Square X^2 = 14.752
3-4	1559	26.5	564	36.2	995	63.8		
≤2	4026	68.4	1675	41.6	2351	58.4		
How many regular sodas or glasses of sweet tea did you drink each day?								
<1 time/ day	2996	50.9	1170	39.1	1826	60.9	*P=0.003**	Chi Square X^2 = 11.880
1-2 times	2049	34.8	800	39.0	1249	61.0		
≥3 times	838	14.3	380	45.3	458	54.7		
How many times a week did you eat beans, chicken or fish?								
≥3 times	3965	67.4	1601	40.4	2364	59.6	P= 0.176	Chi Square X^2 = 3.469
1-2 times	1607	27.3	615	38.3	992	61.7		
<1 time/ week	311	5.3	134	43.1	177	56.9		
How many times a week did you eat regular snack chips or crackers (non-low fat)?								
Once or less	2224	37.8	803	36.1	1421	63.9	*P<0.001**	Chi Square X^2 = 30.948
2-3 times	2540	43.2	1033	40.7	1507	59.3		
≥4 times	1119	19.0	514	45.9	605	54.1		

How many times a week did you eat desserts or other sweets (non-low fat)?								
Once or less	2270	38.6	822	36.2	1448	63.8	*P<0.001**	Chi Square $X^2 = 27.815$
2-3 times	2680	45.6	1101	41.1	1579	58.9		
≥4 times	933	15.8	427	45.8	506	54.2		
How much margarine, butter or animal fat do you use to season vegetables or put on potatoes, bread or corn?								
Very little	1825	31.0	672	36.8	1153	63.2	*P=0.001**	Chi Square $X^2 = 13.554$
Some	3443	58.5	1405	40.8	2038	59.2		
A lot	615	10.5	273	44.4	342	55.6		

The (*) signify statistically significant results, typically with a p-value less than 0.05

Table 4: Scores of STC items' consumption and summary score for all cases and split by presence or absence of IBS, (Mean ± SD, Median and IQR)

STC items' consumption		Overall (n= 5883)	IBS (n=2350) (39.9%)	Non-IBS (n= 3533) (60.1%)	*p*- value	Test of significance Mann-Whitney U
Fast food consumption per week	Mean ± SD Median IQR	0.79±0.69 1.00 0.00- 1.00	0.86±0.69 1.00 0.00- 1.00	0.74±0.68 1.00 0.00- 1.00	*P<0.001**	U= 3756759.50
Fruit servings per day	Mean ± SD Median IQR	1.67±0.56 2.00 1.00- 2.00	1.70±0.54 2.00 1.00- 2.00	1.65± 0.57 2.00 1.00- 2.00	*P<0.001**	U= 3963829.00
Vegetable servings per day	Mean ± SD Median IQR	1.63± 0.58 2.00 1.00- 2.00	1.67±0.56 2.00 1.00- 2.00	1.61±0.59 2.00 1.00- 2.00	*P<0.001**	U= 3957301.00
Regular soda / sweet tea consumption per day	Mean ± SD Median IQR	0.63± 0.72 0.00 0.00- 1.00	0.66±0.74 1.00 0.00- 1.00	0.61±0.70 0.00 0.00- 1.00	*P= 0.022**	U= 4018420.00
Beans/ chicken/ fish consumption per week	Mean ± SD Median IQR	0.38± 0.58 0.00 0.00- 1.00	0.38±0.59 0.00 0.00- 1.00	0.38± 0.58 0.00 0.00- 1.00	P= 0.463	U= 4112845.00
Regular snack chips/ crackers consumption per week	Mean ± SD Median IQR	0.81±0.73 1.00 0.00- 1.00	0.88±0.74 1.00 0.00- 1.00	0.77±0.72 1.00 0.00- 1.00	*P<0.001**	U= 3825283.00
Desserts / other sweets consumption per week	Mean ± SD Median IQR	0.77±0.70 1.00 0.00- 1.00	0.83±0.71 1.00 0.00- 1.00	0.73±0.69 1.00 0.00- 1.00	*P<0.001**	U= 3843374.50
Amount of margarine / butter / animal	Mean ± SD Median	0.79±0.61 1.00	0.83±0.61 1.00	0.77±0.61 1.00	*P<0.001**	U= 3945656.00

fat used to season food	IQR	0.00- 1.00	0.00- 1.00	0.00- 1.00		
Eight- item Summary score	Mean ± SD	7.48±2.32	7.81±2.32	7.27±2.29	*P<0.001**	U= 3613355.00
	Median	7.00	8.00	7.00		
	IQR	6.00 -9.00	6.00 -9.00	6.00 -9.00		

SD: Standard Deviation IQR: Inter-Quartile Range

The (*) signify statistically significant results, typically with a p-value less than 0.05

Table 5: Binary logistic regression model for risk factors associated with IBS

Covariates	OR	95% CI	*p*- value
Age categories (year)			P=0.308
17-20	0.88	0.70-1.12	
21-24 (ref)	1		
Sex			*P<0.001**
Female	1.78	1.58-2.00	
Male (ref)	1		
Academic year			
Junior (1, 2, 3)	1.16	0.95-1.42	P=0.158
Senior (4,5, intern) (ref)	1		
Fast food consumption per week			*P<0.001**
<1 time/ week (ref)	1		
1-3 times/ week	1.24	1.09-1.40	*P=0.001**
≥4 times/ week	1.49	1.25-1.77	*P<0.001**
Fruit servings per day			P=0.181
≤ 2 times/ day	1.08	0.82-1.43	
3-4 / day	0.95	0.71-1.28	
≥5 times/ day (ref)	1		
Vegetable servings per day			P=0.211
≤ 2 times/day	1.09	0.78-1.33	
3-4/day	0.91	0.69-1.20	
≥5 times/day (ref)	1		
Soda / sweetened drinks per day			*P= 0.033**
<1time/ day (ref)	1		
1-2 times / day	0.96	0.85-1.08	P= 0.469
≥3 times/day	1.20	1.01-1.41	*P= 0.033**
Snack chips/crackers consumption per week (not low fat)			P= 0.328
<1time/ week (ref)			

1-3 times/ week	1		
≥4 times/week	1.07	0.94-1.21	
	1.13	0.96-1.33	
Desserts/ sweets consumption per week (not low fat)			*P= 0.039**
<1time/ week (ref)			
1-3 times/ week	1		
≥4 times/week	1.13	1.01-1.28	*P= 0.045**
	1.22	1.03-1.45	*P= 0.021**
Amount of fat (margarine, butter, oil or animal fat) usually added to your food			
Very little amount (ref)			P= 0.228
Some	1		
A lot	1.11	0.98-1.25	
	1.11	0.91-1.35	
Presence of food intolerance			
No (ref)	1		*P<0.001**
Yes	1.81	1.58-2.07	
Usage of medications			
No (ref)	1		*P<0.001**
Yes	2.96	2.51-3.49	
Water consumption per day			*P= 0.045**
<2 L/ day	1.15	1.01-1.31	
≥ 2 times/ day (ref)	1		
The usual sleep pattern			*P<0.001**
Interrupted	1.58	1.42-1.77	

Regular (ref)	1	
Constant (-1.279)	0.278	P=0.084

OR: Odds Ratio, CI: confidence interval

The (*) signify statistically significant results, typically with a p-value less than 0.05