

Irritable bowel syndrome-related symptoms among medical students in Bosnia and Herzegovina

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ABSTRACT

Aim To determine the prevalence of irritable bowel syndrome (IBS)-related symptoms and associated factors among medical students in Bosnia and Herzegovina.

Methods This cross-sectional online survey included 176 medical students from the universities of Sarajevo and Zenica between November 2022 and December 2023. IBS-related symptoms were assessed using the Serbian-language Rome III questionnaire, and test anxiety using the Westside Test Anxiety Scale. Categorical variables were compared using Pearson's χ^2 test.

Results Eighty-four students (47.7%) met the symptom-based Rome III criteria. The IBS-related symptoms group included 75 females (89.3%) compared with 54 (58.7%) in the comparison group ($p < 0.001$). Sweets consumption at least four times weekly was reported by 53 (63.1%) and 45 (48.9%) students, respectively ($p = 0.021$). Test-anxiety distributions differed between groups ($p < 0.001$); extremely high anxiety was reported by 12 (14.3%) students with IBS-related symptoms and one (1.1%) without symptoms. Other sociodemographic and lifestyle characteristics were not associated with IBS-related symptoms.

Conclusion IBS-related symptoms were frequent in this medical-student sample and were associated with female sex, frequent sweets consumption, and test anxiety. The cross-sectional, self-reported design precludes causal interpretation and clinical confirmation of IBS.

Keywords: anxiety, irritable bowel syndrome, students, surveys and questionnaires

INTRODUCTION

Irritable bowel syndrome (IBS) is a disorder of gut–brain interaction characterised by recurrent abdominal pain associated with altered bowel habits. Its multifactorial pathophysiology involves gastrointestinal dysmotility, visceral hypersensitivity, immune signalling, and changes in the intestinal microbiota. IBS can substantially impair quality of life and daily functioning (1,2).

Prevalence estimates vary according to the diagnostic criteria and population studied (3). Rome III-based estimates are generally higher than Rome IV-based estimates (3,4). A recent systematic review found substantial heterogeneity and a considerable symptom burden among medical students (5). Female

sex and psychological distress are among the most consistently reported associated factors (5,6).

Although stress-related gastrointestinal symptoms have been reported among students in Bosnia and Herzegovina (7), evidence specifically addressing IBS-related symptoms in medical students remains scarce. This population may be particularly vulnerable because of sustained academic pressure, irregular dietary habits, and psychological distress. Establishing the local prevalence and identifying associated factors are therefore important for defining the magnitude of the problem and informing targeted student-health interventions.

The aim of this study was to determine the prevalence of IBS-related symptoms among medical students at two universities in Bosnia and Herzegovina and to examine associated sociodemographic, lifestyle, and test-anxiety factors.

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MATERIAL AND METHODS

Subjects and study design

This cross-sectional study used an anonymous online questionnaire distributed through official student e-mail channels between November 2022 and December 2023. The convenience sample comprised 176 students enrolled in the six-year integrated medical programmes at the University of Sarajevo and the University of Zenica. All submitted records were complete and included in the analysis.

Eligible participants were medical students aged 18 years or older. Students reporting a diagnosed gastrointestinal disorder, including gastro-oesophageal reflux disease, coeliac disease, gastrointestinal tumours, rectal bleeding, or previous gastrointestinal surgery, were excluded. Participants meeting the symptom-based Rome III criteria were classified as having IBS-related symptoms; all others formed the comparison group.

Participation was voluntary and anonymous. The study received a positive ethical opinion and approval from the Ethics Council of the University of Sarajevo (No. 0101-678-2/23; 20 January 2023) and approval to conduct the study from the Faculty of Medicine, University of Zenica (No. 05-100-020-590/22; 23 November 2022). The study was conducted in accordance with the Declaration of Helsinki.

Measures

The questionnaire contained sections on sociodemographic and lifestyle characteristics, IBS-related symptoms, and test anxiety. Recorded characteristics included age, sex, university, study year, grade point average, marital and living status, physical activity, fast-food and sweet consumption, number of daily meals, body mass index category, and smoking.

IBS-related symptoms were assessed using a licensed Serbian-language adaptation of the Rome III questionnaire. Rome III identifies IBS through recurrent abdominal pain or discomfort present for at least three months, with symptom onset at least six months earlier, and association with at least two of the following: improvement with defecation, change in stool frequency, or change in stool form (4,8). Because diagnoses were not confirmed clinically, the outcome is reported as IBS-related symptoms rather than confirmed IBS.

Test anxiety was assessed using the Westside Test Anxiety Scale (WTAS), with results categorised as comfortably low, normal or average, high-normal, moderately high, high, or extremely high (9).

Statistical analysis

Analyses were performed using IBM SPSS Statistics (version 27.0., IBM Corp., Armonk, NY, USA). Categorical variables are presented as numbers and percentages. Associations between

Table 1. Sociodemographic characteristics according to irritable bowel syndrome-related symptoms

Variable	IBS-related symptoms (N = 84)	No-IBS-related symptoms (N = 92)	Total (N = 176)	<i>p</i>
N (%)				
Sex				
Male	9 (10.7)	38 (41.3)	47 (26.7)	<0.001
Female	75 (89.3)	54 (58.7)	129 (73.3)	
Age				
18–22 years	58 (69.0)	61 (66.3)	119 (67.6)	0.698
≥23 years	26 (31.0)	31 (33.7)	57 (32.4)	
University				
Sarajevo	16 (19.0)	18 (19.6)	34 (19.3)	0.931
Zenica	68 (81.0)	74 (80.4)	142 (80.7)	
Study year				
First	25 (29.8)	21 (22.8)	46 (26.1)	0.286
Second	27 (32.1)	22 (23.9)	49 (27.8)	
Third	8 (9.5)	14 (15.2)	22 (12.5)	
Fourth	16 (19.0)	26 (28.3)	42 (23.9)	
Fifth	6 (7.1)	4 (4.3)	10 (5.7)	
Sixth	2 (2.4)	5 (5.4)	7 (4.0)	
Grade point average				
6.00–7.00	9 (10.7)	15 (16.3)	24 (13.6)	0.324
7.01–8.00	30 (35.7)	38 (41.3)	68 (38.6)	
8.01–9.00	37 (44.0)	35 (38.0)	72 (40.9)	
9.01–10.00	8 (9.5)	4 (4.3)	12 (6.8)	
Marital status				
Single	78 (92.9)	83 (90.2)	161 (91.5)	0.531
Married	6 (7.1)	9 (9.8)	15 (8.5)	
Living arrangement				
With family or roommate	66 (78.6)	77 (83.7)	143 (81.3)	0.677
Alone in an apartment	14 (16.7)	12 (13.0)	26 (14.8)	
Alone in a student dormitory	4 (4.8)	3 (3.3)	7 (4.0)	

IBS, irritable bowel syndrome.

participant characteristics and IBS-related symptoms were examined using Pearson's χ^2 test. Tests were two-sided, and $p < 0.05$ was considered statistically significant.

RESULTS

Among 176 students, 84 (47.7%) met the symptom-based Rome III criteria for IBS-related symptoms. The symptomatic group comprised 75 females (89.3%) and 9 males (10.7%), compared with 54 females (58.7%) and 38 males (41.3%) in the comparison group ($p < 0.001$). Students aged 18–22 years accounted for 58 (69.0%) and 61 (66.3%) participants, respectively ($p = 0.698$), while 68 (81.0%) and 74 (80.4%) attended the University of Zenica ($p = 0.931$). Study year ($p = 0.286$), grade point average ($p = 0.324$), marital status ($p = 0.531$), and living arrangements ($p = 0.677$) did not differ between groups (Table 1).

Sweets consumption at least four times weekly was reported by 53 students with IBS-related symptoms (63.1%) and 45 without symptoms (48.9%) ($p = 0.021$). Physical activity 2–3 times weekly was reported by 25 (29.8%) and 33 (35.9%) students, respectively ($p = 0.314$), and fast-food consumption 1–3 times weekly by 61 (72.6%) and 62 (67.4%) ($p = 0.541$). One to three

meals per day were reported by 66 (78.6%) and 67 (72.8%) students ($p = 0.376$), normal body mass index by 64 (76.2%) and 72 (78.3%) ($p = 0.963$), and smoking by 13 (15.5%) and 22 (23.9%) ($p = 0.161$) (Table 2).

Test-anxiety distributions differed between groups ($p < 0.001$). Comfortably low anxiety was reported by 6 students with IBS-related symptoms (7.1%) and 28 without symptoms (30.4%). Moderately high anxiety was reported by 25 (29.8%) and 17 (18.5%), high anxiety by 14 (16.7%) and 14 (15.2%), and extremely high anxiety by 12 (14.3%) and one (1.1%), respectively (Table 2).

DISCUSSION

Nearly half of the surveyed medical students reported symptoms meeting the Rome III criteria. Female sex, frequent sweet consumption, and higher test anxiety were associated with IBS-related symptoms, whereas other examined sociodemographic and lifestyle variables were not. Because only bivariate comparisons were performed, these findings identify associations rather than independent risk factors.

Table 2. Lifestyle characteristics and test anxiety according to irritable bowel syndrome-related symptoms

Variable	IBS-related symptoms (N=84)	No-IBS-related symptoms (N=92)	Total (N=176)	<i>p</i>
N (%)				
Physical activity				
Never	21 (25.0)	15 (16.3)	36 (20.5)	0.314
Once weekly	24 (28.6)	20 (21.7)	44 (25.0)	
2–3 times weekly	25 (29.8)	33 (35.9)	58 (33.0)	
3–5 times weekly	8 (9.5)	14 (15.2)	22 (12.5)	
5–7 times weekly	6 (7.1)	10 (10.9)	16 (9.1)	
Fast-food consumption				
Never	17 (20.2)	19 (20.7)	36 (20.5)	0.541
1–3 times weekly	61 (72.6)	62 (67.4)	123 (69.9)	
≥4 times weekly	6 (7.1)	11 (12.0)	17 (9.7)	
Sweet consumption				
Never	0 (0.0)	6 (6.5)	6 (3.4)	0.021
1–3 times weekly	31 (36.9)	41 (44.6)	72 (40.9)	
≥4 times weekly	53 (63.1)	45 (48.9)	98 (55.7)	
Meals per day				
1–3	66 (78.6)	67 (72.8)	133 (75.6)	0.376
3–5	18 (21.4)	25 (27.2)	43 (24.4)	
Body mass index				
<20 kg/m ²	4 (4.8)	3 (3.3)	7 (4.0)	0.963
20–<25 kg/m ²	64 (76.2)	72 (78.3)	136 (77.3)	
25–<30 kg/m ²	15 (17.9)	16 (17.4)	31 (17.6)	
≥30 kg/m ²	1 (1.2)	1 (1.1)	2 (1.1)	
Smoking				
Yes	13 (15.5)	22 (23.9)	35 (19.9)	0.161
No	71 (84.5)	70 (76.1)	141 (80.1)	
WTAS category				
Comfortably low	6 (7.1)	28 (30.4)	34 (19.3)	<0.001
Normal or average	15 (17.9)	19 (20.7)	34 (19.3)	
High-normal	12 (14.3)	13 (14.1)	25 (14.2)	
Moderately high	25 (29.8)	17 (18.5)	42 (23.9)	
High	14 (16.7)	14 (15.2)	28 (15.9)	
Extremely high	12 (14.3)	1 (1.1)	13 (7.4)	

IBS, irritable bowel syndrome; WTAS, Westside Test Anxiety Scale.

The observed prevalence of 47.7% was higher than most global estimates based on the Rome III or Rome IV criteria (2,3). A recent systematic review confirmed substantial heterogeneity among medical-student studies (5), whereas individual cohorts generally reported lower prevalence (10–12). Differences in sampling, cultural context, academic workload, and diagnostic criteria may explain this variation. Rome III is less restrictive than Rome IV (3,4), and the use of an online symptom questionnaire without clinical assessment may also have increased case identification. A recent paediatric study from Bosnia and Herzegovina documented a substantial burden of functional gastrointestinal disorders, although its population precludes direct comparison (13). The present estimate should therefore be interpreted as the prevalence of IBS-related symptoms, not confirmed IBS.

The association with female sex is consistent with findings from medical-student populations (14) and meta-analytic evidence showing a higher prevalence of IBS among women (15). Sex-related differences in visceral sensitivity, hormonal signalling, stress responses, and symptom reporting may contribute to this association (16). However, the cross-sectional design cannot distinguish biological effects from sociocultural or healthcare-seeking factors.

Frequent sweets consumption showed a modest association with IBS-related symptoms. Food-related gastrointestinal symptoms are common in IBS (17), and fermentable carbohydrates may provoke symptoms in susceptible individuals (18,19).

The marked difference in WTAS categories supports the relationship between gastrointestinal symptoms and psychological distress in students. Associations with anxiety have been reported among medical students in Saudi Arabia (20), Malaysia (21), Ethiopia (6), and Egypt (22). A study of university students in Sarajevo also emphasised the relevance of social and psychological factors for student well-being (23), while local data linked changes in stress intensity with gastrointestinal health (7). The relationship is likely bidirectional through gut–brain mechanisms: gastrointestinal symptoms may increase anxiety, while anxiety may amplify visceral perception and symptom reporting.

This study has several limitations. Its cross-sectional design precludes causal inference, and the voluntary online sample from two universities—predominantly the University of Zenica—limits generalisability and prevents the calculation of a reliable response rate. Symptoms, dietary habits, and anxiety were self-reported, questionnaire timing was not standardised to examination periods, and IBS was not confirmed by clinical evaluation. Rome III rather than Rome IV criteria were used, and no multi-variable model was available to assess independent associations or confounding. Larger multicentre studies using contemporary validated criteria and longitudinal assessment are needed.

CONCLUSION

IBS-related symptoms were common among medical students at the universities of Sarajevo and Zenica. Female sex, frequent sweets consumption, and higher test anxiety were associated with symptoms, but causal or independent effects cannot be inferred. Student health programmes should combine education about persistent gastrointestinal symptoms with access to appropriate clinical evaluation and psychological support.

FUNDING

No specific funding was received for this study.

CONFLICTS OF INTEREST

None to declare.

ETHICS STATEMENT

The study received a positive ethical opinion and approval from the Ethics Council of the University of Sarajevo (No. 0101-678-2/23; 20 January 2023) and approval to conduct the study from the Faculty of Medicine, University of Zenica (No. 05-100-020-590/22; 23 November 2022). Participation was voluntary and anonymous, and the study was conducted in accordance with the Declaration of Helsinki.

DATA AVAILABILITY STATEMENT

The anonymised data are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS (CRediT)

Conceptualization: A.D. -K., B.D., S.S.; **Data curation:** S.H.; **Formal analysis:** A.B., M.B., S.S.; **Investigation:** A.D. -K., A.M., A.B., M.B., H.H.K., S.S., S.K.V., L.T.L.; **Methodology:** J.K.; **Project administration:** E.Beg.; **Resources:** A.D. -K.; **Software:** E.Beg., E.Bec.; **Supervision:** J.K., E.Beg., S.S.; **Validation:** J.K., E.Beg., S.S.; **Visualization:** S.H., S.S.; **Writing – original draft:** A.D. -K., M.B., H.H.K., E.Bec., S.S.; **Writing – review & editing:** A.D. -K., E.Beg., S.S. All authors have read and agreed to the published version of the manuscript.

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