

# Irritable bowel syndrome among Jordanian medical students: Prevalence and associated factors

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## Research article

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## Abstract

## Background

The literature on the prevalence of irritable bowel syndrome (IBS) and its correlates in Middle Eastern countries is scarce. This study aimed at investigating the prevalence of IBS and its associated factors among Jordanian medical students.

## Methods

We conducted a cross-sectional study at two medical faculties in northern Jordan. Using convenience sampling, we recruited 1094 medical students. Participants completed an anonymous semi-structured questionnaire inquiring about socio-demographic, lifestyle, and clinical characteristics, as well as IBS symptoms. We used the Rome III criteria to diagnose IBS and the Hospital Anxiety and Depression Scale (HADS) to identify anxiety and depression. The chi-square test was used to determine differences between categorical variables and stepwise logistic regression was used to measure the association between IBS and its risk factors.

## Results

The prevalence of IBS in our sample was 30.9%. Binary logistic regression analysis of factors associated with IBS indicated having a family history of IBS as a strong predictor of the disease (OR = 8.09; CI: 5.84–11.19). Students at second and third-year levels of their study had ORs of about 4 (CI: 2.20–6.54) and 3 (CI: 1.70–5.30) of suffering from IBS, respectively, as compared to students at first-year level ( $p = 0.001$ ). Increased anxiety score (OR = 1.88; CI: 1.30–2.71), poor sleep quality (OR = 1.76; CI: 1.13–2.76), female gender (OR = 1.59; CI: 1.14–2.20) and living in a school dormitory (OR = 1.35; CI: 1.00–1.84) were significantly associated with IBS ( $p < 0.05$ ). Conversely, consumption of junk food, BMI of participants, and physical inactivity were not significantly associated with IBS occurrence.

## Conclusions

Irritable bowel syndrome is a highly prevalent disorder in a university-based population in the Jordanian context, with several modifiable and non-modifiable factors being associated with its occurrence. A better understanding of the associated risk factors is crucial for a holistic therapeutic approach. Longitudinal studies are necessary to assess whether this association is causal.

## Introduction

Irritable bowel syndrome (IBS) is a chronic functional gastrointestinal disorder characterized by recurrent abdominal pain and altered bowel habits. The Rome III criteria are the most widely used to diagnose IBS [1]. Studies using the Rome III criteria report a prevalence of IBS in Western countries in the range of 10 to 20% [2], whereas the prevalence in the Far East region ranges from 1 to 10% [3], and reaches 21% in South America [2]. Studies from developing countries, including Jordan, are scarce [4].

The prevalence of IBS varies by socioeconomic factors, gender, and age [2]. In developed countries, women are reported to be 2–4 times more likely to have IBS compared to men [2]. Irritable bowel syndrome is more prevalent among adolescents and declines with age. Several studies report that the odds of having IBS are higher among those younger than 50 years compared to those older than 50 years of age [2,5]. Jordan is a Middle Eastern, middle-income country with a population of about ten million, with one half the population composed of adolescents and young adults (age 15–49 years) [6]. Therefore, it is anticipated that the prevalence of IBS in the general population is high.

Lifestyle factors such as unhealthy eating habits (junk or fast food), smoking, alcohol consumption, and physical inactivity have been linked to IBS [7,8]. Irritable bowel syndrome has been also associated with psychological factors such as stress, depression, and anxiety [9, 10]. Additionally, genetic factors have been implicated, with 33% of patients with IBS reporting a positive family history [2]. Irritable bowel syndrome is associated with a considerable reduction in the quality of life, accompanied by significant socioeconomic and psychological consequences [11, 12]. In the clinical setting, IBS represents a large proportion of gastrointestinal workload in both primary and secondary care [12].

University students, particularly medical students, are more likely to be limited in terms of access to healthy foods and subjected to the substantial stress load that accompanies their studies and examinations. Thus, they are supposedly more prone to develop IBS than other population subgroups [13]. A recent study of Lebanese university students reported an overall prevalence of 20% using the Rome III criteria [12]. This study aimed to assess the prevalence of IBS among Jordanian medical students and to investigate the socio-demographic, lifestyle, and clinical factors associated with IBS. A better understanding of IBS correlates is expected to improve our therapeutic approach to IBS patients.

## Methods

Between January 2019 and April 2019, we conducted a cross-sectional study at the Faculty of Medicine, Jordan University of Science and Technology, and the Faculty of Medicine, Yarmouk University, both located in Northern Jordan. Participants (1st to 6th -year medical students) were invited to complete an anonymous semi-structured questionnaire inquiring about demographic, social, lifestyle, and clinical characteristics, as well as IBS symptoms, if any. In this study, we recruited a convenience sample of 1094 medical students. To determine the presence of IBS, we used the Rome III criteria. The questionnaire

consisted of three parts: the first part included questions on demographic and socioeconomic characteristics of participants; the second part explored the clinical and lifestyle factors; the third part consisted of questions aimed to determine the presence of IBS based on the Rome III criteria. Additionally, we used the validated Hospital Anxiety and Depression Scale (HADS) to evaluate the presence of anxiety and/or depression in our study subjects. Despite the established validity of the instruments used, a pilot testing analysis on 30 participants was carried out and revealed Cronbach's alpha scores of 0.83 and 0.88 for both Rome III criteria and HADS instruments, respectively. Both scales were presented to participants in the English language as English is the formal language of study in all medical colleges in Jordan. Furthermore, the objectives of the study were explained in detail to the participants by trained medical residents. All participants provided a verbal informed consent (approved by our institutional review board). Students with significant comorbidities or a definite or suspected history of inflammatory bowel disease, celiac disease, or peptic ulcer disease were excluded from participating in the survey.

## Rome III criteria

The diagnosis of IBS was based on Rome III criteria for Functional Gastrointestinal Disorders [1, 14]. This diagnostic tool defines IBS as recurrent abdominal pain or discomfort for at least 3 days/month during last 3 months associated with two or more of the following features: (1) Improvement with defecation, (2) and/or onset associated with a change in frequency of stool, (3) and/or onset associated with a change in form (appearance) of stool.

## Hospital Anxiety and Depression Scale (HADS)

The HADS is commonly used by physicians to determine the level of anxiety and depression that an individual is experiencing [15]. The HADS is a fourteen-item diagnostic tool, with seven of the items related to anxiety and seven related to depression. Each item in the questionnaire is scored from 0–3, and this means that an individual can score between 0 and 21 for either anxiety or depression with the following categories: 0–7 = Normal; 8–10 = Borderline; 11–21 = Abnormal (case).

## Sample size calculation

The sample size was calculated based on the probability that the prevalence of IBS in Jordan is 20% and the error in the estimate is  $\pm 3.4\%$ , with a 95% confidence interval. Based on that assumption, the required sample size was 532.

## Data analysis

We analyzed all data using SPSS (Version 20 for Windows). Frequency distribution and descriptive statistics were calculated. We compared questionnaire responses using the chi-square test. A  $p$ -value of  $< 0.05$  was used to indicate statistical significance in all cases. Potential risk factors for IBS with a  $p$ -value  $\leq 0.25$  in the cross-tabulation analysis were subjected to a stepwise binary logistic regression analysis.

## Results

A total of 1135 students participated in the study. Questionnaires with complete data were returned by 1094 participants whereas 31 questionnaires were excluded from analysis due to insufficient data (response rate = 96.4%). Our study population age ranged from 18 to 24 years. As illustrated in Table 1, female participants were slightly more represented than males in the study (54.3% females; 45.7% males).

Concerning the lifestyle of study participants, most of the participants had junk food 1-3 times per week. Concerning sleep patterns, about 40% and 14% of participants reported having fair and poor sleep quality, respectively. About 70% of them did not practice physical exercise regularly or practiced for less than 30 minutes per day.

As shown in Table 2, most demographic and lifestyle factors had significant statistical associations with IBS. Conversely, the BMI of participants, consumption of junk food, and physical inactivity were not significantly associated with IBS.

To identify factors associated with IBS, all risk factors with a  $p$ -value  $\leq 0.25$  in the univariate analysis were included in a stepwise binary logistic regression analysis. Table 3 illustrates the statistically significant risk factors in the last regression model. Participants with a positive family history of IBS were 8 times more likely to have the disorder compared to their counterparts with negative family history. An increased anxiety score was associated with IBS among participants, whereas depression was not. Interestingly, the odds of having IBS increased among second and third-year medical students and then declined among 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup>-year students compared to those in the 1<sup>st</sup>-year study level.

## Discussion

To our knowledge, this is the first study using the Rome III criteria of the prevalence and the associated factors of IBS in a cohort of Jordanian medical students. The overall prevalence of IBS in the study sample was 30.9%, which is much higher than that in Western populations. This result is similar to results from Saudi Arabia reporting that one-third of the paramedical students were diagnosed as having IBS, based on Rome-III criteria [16]. In a study from Colombia, the prevalence of IBS among university students was 24% [17]. In agreement with our study, results inferred from a recent Lebanese study found that individuals aged less than 30 years were at a higher risk of having IBS [18]. The high prevalence of IBS in this subgroup of the population could be attributed to a higher level of anxiety, which was a common finding in most of the reported studies.

In the current study, females had a higher risk for having IBS compared to males. This result is consistent with results from a recent study of the prevalence of IBS among Pakistani medical students using ROME III criteria [19]. Similar results were reported from Saudi Arabia [16], Iraq [20], and Nigeria [21]. Results of the current study and other studies concerning gender differences in having IBS agree with a meta-analysis review which concluded that female sex hormones may affect the severity of IBS symptoms [22].

Congruent with our findings of a higher risk for IBS among students who live in school dormitory compared to those living with their families, studies from Lebanon [7] and Malaysia [23] reported similar results. Arguably, a higher prevalence of IBS in students who live with their families may be due to shared family environmental exposures.

A positive family history of IBS places participants at higher odds of having IBS. This trend was observed among university students in Saudi Arabia [16] and South Korea [24]. Such finding is supported by the notion that genetic factors are important for the familial clustering of IBS and familial odds for having IBS among first-degree relatives [25].

Concerning sleep patterns, our results reported an association between IBS and poor sleep quality. Consistent with our results, this finding was reported by medical students from Saudi Arabia [16]. In a more recent study of 956 individuals with sleep disturbance (using the Pittsburgh Sleep Quality Index), the authors found that sleep disturbance was significantly associated IBS [26]. In the current study, participants with IBS had significantly higher levels of anxiety than their counterparts. This result was reported by Nigerian medical students [21] and university students in South Korea [24]. A recent meta-analysis review concluded that anxiety level is higher in patients with IBS than in healthy controls [10]. Such a result is expected as IBS is a stress-sensitive disorder [27]. Therefore, anxiety symptoms should be systematically verified and treated in IBS patients, as psychological factors are important determinants of symptoms severity and persistence, willingness to seek treatment and response to therapy. Yet, longitudinal studies of the effect of psychiatric evaluation and treatment of IBS patients are warranted.

Concerning IBS according to study level, in the current study second and 3rd -year medical students were at greater risk compared to freshman students and those in the 4th, 5th, and 6th -year students. This finding is congruent with findings from an Iranian study [28]. In that study, IBS was more prevalent in the 1st and 2nd year compared to 4th and 5th -year medical students. Conversely, a Canadian study from Schulich School of Medicine and Dentistry in Ontario found an insignificant statistical difference between preclinical and clerkship medical students with IBS [29]. Arguably, the study level seems to contribute to the prevalence of IBS among medical students. However, a clear trend has not been firmly established between different levels. Students in their 2nd and 3rd -year level encounter the most challenging time due to their introduction to a new environment with difficult situations aggravated by the nature of integrative modular systems of study during these two years. We believe that fear of failing exams and anxiety levels increase, thus leading to a significant increase in IBS prevalence.

The strength of this research is the high questionnaire response rate and the large sample size, which substantiate the validity of our findings. However, our study had two limitations. First, the survey was restricted to medical students, which might influence the generalizability of our results to the Jordanian population. Second, the diagnosis of IBS was based on self-reporting questionnaires, without using any objective tests to exclude organic disorders.

## Conclusions

This study found a high prevalence of IBS among Jordanian medical students. Several modifiable and non-modifiable risk factors for IBS have been identified. Owing to the multifaceted pathophysiology of this disorder, an improved understanding of the associated risk factors is required for a holistic therapeutic approach. We believe that findings from this study have important implications for national programs designed to improve academic performance, stress management and overall quality of life among students suffering from IBS. Finally, longitudinal surveys are needed to establish whether this putative association is causal.

## Abbreviations

IBS: Irritable bowel syndrome; HADS: Hospital anxiety and depression scale; BMI: Body mass index

## Declarations

### *Ethics approval and consent to participate*

The study was approved by the Institutional Review Board (IRB) at King Abdullah University Hospital and the Jordan University of Science and Technology (Grant Number: 20180165). Verbal consent was obtained from all participants and approved by the IRB, and all study procedures were conducted according to the [World Medical Association Declaration of Helsinki](#).

### *Consent for publication*

Not applicable.

### *Availability of data and materials*

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

### *Competing interests*

The authors declare that they have no competing interests.

### *Funding*

Not applicable.

### *Authors' contributions*

K.J. and M.K. designed this study and drafted the manuscript. M.K. performed the statistical data analysis. K.J. reviewed the manuscript for intellectual content. E.S, A.S., and B.A. collected the data, reviewed the literature, and contributed to the writing of the manuscript. All authors have read and approved the final version of the manuscript, and provided critical feedback.

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## Tables

**Table 1: Demographic, lifestyle and clinical characteristics of study population (n=1094)**

<b>Characteristic</b>	<b>n (%)</b>
<b>Gender</b>	
Male	500 (45.7)
Female	594 (54.3)
<b>Study level/year</b>	
1	297 (27.1)
2	228 (20.8)
3	146 (13.3)
4	140 (12.8)
5	182 (16.7)
6	101 (9.3)
<b>BMI</b>	
Underweight	78 (7.2)
Normal	655 (60.1)
Overweight	267 (24.5)
Obese	89 (8.2)
<b>Marital status</b>	
Single	1074 (98.2)
Married	20 (1.8)
<b>Living condition</b>	
With family	633 (57.9)
School dormitory or private	461 (42.1)
<b>Monthly income/ID</b>	
Less than 700	236 (21.6)
700-1499	309 (28.2)
1500+	549 (50.2)
<b>Participants' perception of having IBS</b>	
No	765 (69.9)
Yes	329 (30.1)
<b>Diagnosis with IBS</b>	
No	756 (69.1)
Yes	338 (30.9)
<b>Depression score</b>	
Normal	627 (57.3)
Borderline	261 (23.9)
Case	206 (18.8)
<b>Anxiety score</b>	
Normal	544 (49.7)
Borderline	282 (25.8)
Case	268 (24.5)
<b>Sleep patterns</b>	
Good	508 (46.4)
Fair	436 (39.9)
Poor	150 (13.7)
<b>Junk food meals /week</b>	

<i>Never</i>	<i>131 (12.0)</i>
<i>1-3</i>	<i>801 (73.6)</i>
<i>4+</i>	<i>162 (14.4)</i>

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*BMI: Body mass index; IBS: Irritable bowel syndrome*

Table 2: Cross-tabulation of demographic and lifestyle factors associated with IBS\* among medical students (n=1094)

Variable	IBS		p-value
	Yes n (%)	No n (%)	
<b>Gender</b>			.011
Female	203 (60.1)	391 (51.7)	
Male	135 (39.9)	365 (48.3)	
<b>Study level/year</b>			.001
1	78 (23.1)	219 (29.0)	
2	63 (18.6)	165 (21.8)	
3	54 (16.0)	92 (12.2)	
4	40 (11.8)	100 (13.2)	
5	55 (16.3)	127 (16.8)	
6	48 (14.2)	53 (7.0)	
<b>BMI</b>			.136
Underweight	21 (6.2)	57 (7.6)	
Normal	192 (56.8)	463 (61.7)	
Overweight	98 (29.0)	169 (22.4)	
Obese	27 (8.0)	62 (8.3)	
<b>Physical activity</b>			.260
No	193 (57.1)	459 (60.7)	
Yes	145 (42.9)	297 (39.3)	
<b>Living conditions</b>			.010
With family	176 (52.1)	457 (60.4)	
School dormitory or private	162 (47.9)	299 (39.6)	
<b>Junk food meals /week</b>			.529
Never	46 (13.6)	85 (11.3)	
1-3	242 (71.8)	559 (74.3)	
4+	49 (14.5)	107 (14.4)	
<b>Sleep patterns</b>			.001
Good	131 (38.8)	377 (49.9)	
Fair	146 (43.2)	290 (38.4)	
Poor	61 (18.0)	89 (11.7)	
<b>Family history of IBS</b>			.001
No	157 (46.6)	650 (86.1)	
Yes	180 (53.4)	105 (13.9)	
<b>Depression score</b>			.003
Normal	171 (50.6)	456 (60.3)	
Borderline	85 (25.1)	176 (23.3)	
Case	82 (24.3)	124 (16.4)	
<b>Anxiety score</b>			.001
Normal	139 (41.1)	405 (53.6)	
Borderline	84 (24.9)	198 (26.2)	
Case	115 (34.0)	153 (20.2)	

\*IBS: Irritable Bowel Syndrome; BMI: Body mass index

**Table 3. Binary logistic regression analysis of factors associated with IBS\* (n=1094)**

Variable	OR	95% C.I		p-value
		Lower	Upper	
<b>Gender</b>				
Male	1**			0.005
Female	1.59	1.14	2.20	
<b>Study level/year</b>				
1	1**			0.001
2	3.79	2.20	6.54	
3	3.00	1.70	5.30	
4	2.01	1.11	3.65	
5	2.37	1.28	4.39	
6	2.61	1.46	4.67	
<b>Family history of IBS</b>				
No	1**			0.001
Yes	8.09	5.84	11.19	
<b>Living condition</b>				
With family	1**			0.052
School dormitory or private	1.35	1.00	1.84	
<b>Sleep pattern</b>				
Good	1**			0.016
Fair	1.20	0.77	1.88	
Poor	1.76	1.13	2.76	
<b>Anxiety score</b>				
Normal	1**			0.003
Borderline	1.55	1.03	2.33	
Case	1.88	1.30	2.71	

\*Irritable bowel syndrome; \*\* Reference for other categories within each variable.