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Irritable bowel syndrome and its associated factors among Jordanian medical students

A cross-sectional study

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Abstract

Very scarce studies investigated the prevalence of irritable bowel syndrome (IBS) and its correlates in the Middle East, particularly in college students. We aimed to investigate the prevalence of IBS and its associated factors among Jordanian medical students. We conducted a cross-sectional study at 2 medical facilities in northern Jordan. We recruited 1135 medical students. Participants completed an anonymous questionnaire addressing sociodemographic, lifestyle, and clinical characteristics. An interview questionnaire was used to diagnose IBS according to the Rome III criteria. Comorbid anxiety and depression were diagnosed by using the Hospital Anxiety and Depression Scale. Of the 1135 completed questionnaires, 1094 (94%) had complete data. 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 (odds ratio [OR]: 8.09; 95% confidence interval [CI]: 5.84–11.19). Students in the second and third years of their study had ORs of approximately 4 (95% CI: 2.20–6.54) and 3 (95% CI: 1.70–5.30) for suffering from IBS, respectively, compared with those in the first year (P = .001). Increased anxiety score (OR: 1.88; 95% CI: 1.30–2.71), poor sleep quality (OR: 1.76; 95% CI: 1.13–2.76), female sex (OR: 1.59; 95% CI: 1.14–2.20), and living in a school dormitory (OR: 1.35; 95% CI: 1.00–1.84) were significantly associated with IBS (P < .05). IBS is a highly prevalent disorder among Jordanian medical students, with several factors associated with its occurrence.

Abbreviations: BMI = body mass index, HADS = Hospital Anxiety and Depression Scale, IBS = irritable bowel syndrome, OR = odds ratio.

Keywords: anxiety, epidemiology, irritable bowel syndrome, Jordan, lifestyle, medical students

1. Introduction

Irritable bowel syndrome (IBS) is a chronic functional gastrointestinal disorder characterized by recurrent abdominal pain and altered bowel habits. The pathophysiology of IBS is not completely understood, and it encompasses a variety of factors such as disordered motility, visceral hypersensitivity, abnormal immune and mucosal function, altered intestinal microbiota, and abnormal central nervous system processing.[1] IBS is also highly influenced by demographic, ethnic, psychological, and environmental factors.[1,2]

Although IBS is very common in clinical settings, little is known about its global prevalence and distribution among specific population subgroups. Studies using the Rome III criteria reported a prevalence of IBS in Western countries ranging from 10% to 20% and a broad range of prevalence among different countries (1.1%–45.0%).[2] The prevalence in the Far East ranges from 1% to 10%[3] and reaches 21% in South America.[2] In a recent meta-analysis by Oka et al,[4] the pooled prevalence of IBS in 53 surveys that used the Rome III criteria from 38 countries was 9.2% (95% CI 7.6–10.8; I^2 = 99.7%). Conversely, the pooled IBS prevalence among the 6 surveys that used the Rome IV criteria from 34 countries was 3.8% (95% CI 3.1–4.5; I^2 = 96.6%).[4] It remains unclear whether the different prevalence rates detected in surveys from individual countries represent real differences between populations or are attributable to methodological differences between those surveys. However, studies from developing countries, including Jordan, are scarce.[5]

The prevalence of IBS varies depending on socioeconomic factors, sex, and age.[2] In developed countries, females have a 2 to 4-fold higher likelihood of developing IBS compared

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The datasets used and analyzed in the present study are available from the corresponding author upon reasonable request.

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

The authors declare that they have no competing interests.

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to males.[2,4] IBS is more prevalent among young individuals and declines with age. Several studies have reported that the odds of developing IBS are higher among individuals aged <50 years than among those aged >50 years.[2,6] Jordan is a Middle Eastern, middle-income country with a population of approximately 10 million. One half of the population is composed of adolescents and young adults (age: 15–49 years).[7] Therefore, it is anticipated that the prevalence of IBS in the Jordanian general population is high.

Lifestyle factors, such as unhealthy eating habits (junk or fast food), cigarette smoking, and physical inactivity, have been linked to IBS.[8,9] IBS has also been associated with psychological factors such as stress, depression, and anxiety.[10,11] Additionally, genetic factors have been implicated, with 33% of patients with IBS reporting a positive family history.[2] IBS is associated with a considerable reduction in the quality of life, accompanied by significant socioeconomic and psychological consequences.[12] In the clinical setting, IBS represents a large proportion of the gastrointestinal workload in both primary and secondary care, resulting in significant economic burden.[13] University students, particularly medical students, are more likely to have limited access to healthy meals, financial constraints, and a substantial burden of stress secondary to their exceedingly demanding education and frequent examinations.[14] Thus, they are supposedly more prone to developing IBS than other population subgroups. An observational study of Lebanese university students reported an overall prevalence of 20% using the Rome III criteria.[8]

The aim of the present study was to assess the prevalence of IBS among Jordanian medical students and to investigate the sociodemographic, lifestyle, and clinical factors associated with IBS. A better understanding of IBS correlates is expected to improve our therapeutic approach to IBS in this population subgroup.

2. Methods

2.1. Study subjects

Between January 2020 and April 2020, 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 (first- to sixth-year medical students) were invited to complete an anonymous questionnaire addressing demographic, social, lifestyle, and clinical characteristics. We used an interview questionnaire to diagnose IBS according to the Rome III criteria. Comorbid anxiety and depression were diagnosed by using the Hospital Anxiety and Depression Scale (HADS).In this study, we recruited 1135 Jordanian medical students.

2.2. Questionnaires

The survey consisted of 3 parts. The first part included questions on the demographic and socioeconomic characteristics of the participants. The second part explored clinical and lifestyle factors. The third part consisted of questions aimed at determining the presence of IBS based on the Rome III criteria. Additionally, we used the validated HADS to evaluate the presence of anxiety and/or depression in our study participants. Despite the established validity of the instruments used, a pilot testing analysis on 30 participants revealed Cronbach alpha scores of 0.83 and 0.88 for Rome III criteria and HADS instruments, respectively. Both scales were presented to participants in the English language, as this is the formal language of study in all medical colleges in Jordan. The objectives of the study were explained in detail to the participants. Students with significant comorbidities, a definite or suspected history of inflammatory bowel disease, celiac disease, lactose intolerance, or peptic ulcer disease were excluded from the survey. After screening the students for inclusion and exclusion criteria, they were solicited to fill out a self-administered anonymous questionnaire covering demographic, lifestyle, and clinical characteristics, and then invited to undergo an interview questionnaire.

2.3. Rome III criteria

The diagnosis of IBS was based on the Rome III criteria for functional gastrointestinal disorders.[1,4] This diagnostic tool defines IBS as recurrent abdominal pain or discomfort for at least 3 days per month during the previous 3 months associated with 2 or more of the following features: improvement with defecation, and/or onset associated with a change in the frequency of bowel movement, and onset associated with a change in the form (appearance) of the stool.

2.4. Hospital Anxiety and Depression Scale

The HADS is commonly used by physicians to determine the level of anxiety and depression experienced by an individual.[15] It is a 14-item diagnostic tool that includes 7 items related to anxiety and 7 items related to depression. Each item in the questionnaire was scored from 0 to 3. Hence, an individual can score between 0 and 21 for either anxiety or depression, and be classified into the following categories: 0 to 7, normal; 8 to 10, borderline; and 11 to 21, abnormal (case).

2.5. Sample size calculation

The sample size was calculated based on the probability that the prevalence of IBS in Jordan was 20% and the error in the estimate was ± 3.4%, with a 95% confidence interval (CI). Based on this assumption, the required sample size was 532 participants.

2.6. Data analysis

All data were analyzed using SPSS (version 20 for Windows; IBM Corp., Armonk, NY). Frequency distribution and descriptive statistics were calculated. Questionnaire responses were compared using the chi-square test. A P value of <.05 was used to indicate statistical significance in all cases. Potential risk factors for IBS with a P value of ≤.25 in the cross-tabulation analysis were subjected to stepwise binary logistic regression analysis.

2.7. Ethical considerations

Informed consent from the participants was obtained and all completed questionnaires were kept anonymous and confidential. The present research was reviewed and approved by the institutional review board of King Abdullah University Hospital and the administration of Yarmouk University. This study was approved by the Committee on Human Research at the Jordan University of Science and Technology (grant number: 20180165). All study procedures were conducted in accordance with the Declaration of Helsinki of the World Medical Association.

3. Results

A total of 1135 students participated in this study. Questionnaires with complete data were returned by 1094 participants, whereas 41 questionnaires were excluded from the analysis due to insufficient data (response rate: 96.4%). The age of the study population ranged from 18 to 24 years, and there were more female participants than males (54.3% vs 45.7%, respectively). Table 1 shows the demographic, lifestyle, and clinical characteristics of the study population.

Table 1

Demographic, lifestyle, and clinical characteristics of the study population (N = 1094).

Characteristic	n (%)
Sex	
Male	500 (45.7)
Female	594 (54.3)
Study level, yr	
1	297 (27.1)
2	228 (20.8)
3	146 (13.3)
4	140 (12.8)
5	182 (16.7)
6	101 (9.3)
BMI	
Underweight	78 (7.2)
Normal	655 (60.1)
Overweight	267 (24.5)
Obese	89 (8.2)
Marital status	
Single	1074 (98.2)
Married	20 (1.8)
Living condition	
With family	633 (57.9)
School dormitory or private	461 (42.1)
Monthly income, JD	
<700	236 (21.6)
700–1499	309 (28.2)
≥1500	549 (50.2)
Participants' perception of having IBS	
No	765 (69.9)
Yes	329 (30.1)
Diagnosis of IBS	
No	756 (69.1)
Yes	338 (30.9)
Depression score	
Normal	627 (57.3)
Borderline	261 (23.9)
Case	206 (18.8)
Anxiety score	
Normal	544 (49.7)
Borderline	282 (25.8)
Case	268 (24.5)
Sleep pattern	
Good	508 (46.4)
Fair	436 (39.9)
Poor	150 (13.7)
Junk food meals per week	
Never	131 (12.0)
1–3	801 (73.6)
≥4	162 (14.4)

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).

	IBS		
Variable	Yes, n (%)	No, n (%)	*P* value
Sex			.011
Female	203 (60.1)	391 (51.7)	
Male	135 (39.9)	365 (48.3)	
BMI			.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)	
Physical activity			.260
No	193 (57.1)	459 (60.7)	
Yes	145 (42.9)	297 (39.3)	
Living conditions			.010
With family	176 (52.1)	457 (60.4)	
School dormitory or private	162 (47.9)	299 (39.6)	
Junk food meals per week			.529
Never	46 (13.6)	85 (11.3)	
1–3	242 (71.8)	559 (74.3)	
≥4	49 (14.5)	107 (14.4)	
Sleep pattern			.001
Good	131 (38.8)	377 (49.9)	
Fair	146 (43.2)	290 (38.4)	
Poor	61 (18.0)	89 (11.7)	
Family history of IBS			.001
No	157 (46.6)	650 (86.1)	
Yes	180 (53.4)	105 (13.9)	
Depression score			.003
Normal	171 (50.6)	456 (60.3)	
Borderline	85 (25.1)	176 (23.3)	
Case	82 (24.3)	124 (16.4)	
Anxiety score			.001
Normal	139 (41.1)	405 (53.6)	
Borderline	84 (24.9)	198 (26.2)	
Case	115 (34.0)	153 (20.2)	

BMI = body mass index, IBS = irritable bowel syndrome.

As shown in Table 2, most demographic and lifestyle factors were significantly associated with IBS. Conversely, body mass index, consumption of junk food, and physical inactivity were not significantly associated with IBS.

To identify factors associated with IBS, all risk factors (*P* value of ≤.25) in the univariate analysis were included in a stepwise binary logistic regression analysis. Table 3 shows the statistically significant risk factors detected in the final regression model. Participants with a positive family history of IBS had an 8-fold higher risk of developing the disorder than their counterparts with a negative family history. Unlike depression, an increased anxiety score was associated with IBS among participants. Interestingly, the odds of having IBS increased among second and third-year students, and declined among fourth- to sixth-year students compared with those recorded in first-year students.

4. Discussion

To our knowledge, this is the first study on the prevalence and associated factors of IBS in a cohort of Jordanian medical students. The overall prevalence of IBS in the study sample was 30.9%, which was markedly higher than that reported in Western populations. In this study, the odds of having IBS were significantly higher in females than in males, students residing in school dormitories or in a private house on their own, and among those with a positive family history of IBS. Second and third-year medical students were at higher risk compared with first-year and fourth- to sixth-year students. This study also revealed that anxiety and poor sleep patterns were statistically significant risk factors for IBS occurrence. Conversely, the body mass index of participants, consumption of junk or fast food, and physical inactivity were not significantly associated with IBS.

The 30.9% IBS prevalence in Jordanian medical students is much higher than that found in Western countries, but it is similar to that reported in studies from the Middle East. A study from Saudi Arabia involving 200 medical and nonmedical students found an overall prevalence of IBS of 29.3%, with a much higher prevalence among medical students (42.22%) compared to nonmedical students (16.4%).[16]

This may be attributed to the persistent stress that medical students face throughout their study stages with longer duration of courses and numerous exams; similar results were recently reported by another Saudi study. In that study, approximately one-third of paramedical students were diagnosed with IBS based on the Rome III criteria.[17] An Egyptian survey of 382

Table 3

Binary logistic regression analysis of factors associated with IBS (N = 1094.)

Variable	OR	95% CI		*P* value
		Lower	Upper	
Sex				.005
Male	1*			
Female	1.59	1.14	2.20	
Study level, yr				.001
1	1*			
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	
Family history of IBS				.001
No	1*			
Yes	8.09	5.84	11.19	
Living condition				.052
With family	1*			
School dormitory or private	1.35	1.00	1.84	
Sleep pattern				.016
Good	1*			
Fair	1.20	0.77	1.88	
Poor	1.76	1.13	2.76	
Anxiety score				.003
Normal	1*			
Borderline	1.55	1.03	2.33	
Case	1.88	1.30	2.71	

CI = confidence interval, IBS = irritable bowel syndrome.

*Reference for other categories within each variable.

medical students revealed that 31.7% of participants were affected by IBS, according to the Rome III criteria.[18] In a cross-sectional study from Lebanon, a total of 813 university students were included, and the IBS diagnosis was ascertained using the Rome III criteria.[8] In that study, the authors reported an overall prevalence of 20%. However, a subgroup analysis (medical vs nonmedical students) was not performed in that study, which could explain the relatively lower IBS prevalence. Conversely, the Saudi study by Wani et al revealed that the IBS prevalence in medical students was more than double compared to that in nonmedical students.[16]

The high prevalence of IBS in our study population is probably attributable to their young age and the higher level of anxiety faced throughout their stressful years of study. This has been shown in community-based studies and meta-analyses of Western populations.[2,6]In agreement with those studies, results from a recent Lebanese study demonstrated that individuals aged <30 years were at a higher risk of developing IBS.[19] The authors of that study concluded that the high prevalence of IBS in this subgroup of the population may be attributed to a higher level of anxiety, which is a common finding in most previous studies.[10,11]

In the present study, females were associated with a higher risk of developing IBS compared to males. This result is consistent with findings from a recent study on the prevalence of IBS among Pakistani medical students using the ROME III criteria.[20] Similar results have been reported in Saudi Arabia, Iraq, and Nigeria.[17,21,22] In a meta-analysis by Oka et al,[4] the prevalence of IBS was higher in women than in men (12·0% [95% CI 9.3–15·0] vs 8.6% [6·3–11·2]; odds ratio [OR]: 1.46 [95% CI 1.33–1.59]). The results of this study and other investigations concerning sex differences in relation to IBS agree with a meta-analysis review of 22 studies measuring gender differences in IBS symptoms.[23] In that study, the authors found that both IBS and healthy women reported increased IBS symptoms during the menstrual cycle vs other phases and concluded that female sex hormones may affect the severity of IBS symptoms. In a meta-analysis of 56 studies evaluating the effect of gender on the prevalence of IBS in the community, the OR for IBS in women, compared with men, was 1.67 (95% CI: 1.53–1.82)[24]. Conversely, the prevalence of IBS in South Asian, South American, and African studies was not significantly higher in women than in men.[4] In contrast with previous studies, a Saudi survey found that male students were more likely to be afflicted by IBS.[16] According to the authors of that study, the greater prevalence in males may be attributed to the high expectations from family and society, leading to increased stress.

Our findings of a higher risk for IBS among students residing in school dormitories vs those living with their families corroborate the results of studies conducted in Lebanon and Malaysia.[8,25] Conversely, a higher prevalence of IBS among students who live with their families may be due to shared family environmental exposure. For example, the general personality of the parents, the socioeconomic status of the family, the kind of food the family consumes, and certain stressors are all features of the situation that would be common to the environment experienced by all members within any particular family.

A positive family history of IBS among our participants increased the risk of IBS development (Table 3). This trend was observed among university students in Saudi Arabia and South Korea.[17,26] A case–cohort study from Sweden reported that genetic factors are important for the familial clustering of IBS and familial odds of developing IBS among first-degree, second-degree, and third-degree relatives.[27] In that study, the ORs for IBS were 1.75 for siblings, 1.82 in offspring, 1.90 for parents, 1.10 in maternal half-siblings, 1.78 in paternal half-siblings, 1.27 in nieces/nephews, and 1.11 in cousins. The ORs were also increased (1.51) in spouses of probands diagnosed with IBS, which indicates that a nongenetic contribution is conceivable.

Several studies have suggested that sleep disturbances are linked to functional gastrointestinal disorders, particularly IBS.[28,29] In the present study, we found a statistically significant association between IBS and poor sleep quality (Table 3). Consistent with our results, this finding was reported in a study of medical students from Saudi Arabia.[17] In a more recent study that used the Pittsburgh Sleep Quality Index to investigate 956 individuals with sleep disturbance, sleep disturbance was found to be significantly associated with IBS (OR = 1.51, P = .043).[28] In a study from Italy, the authors investigated the links between quality of sleep and the severity of intestinal symptoms in 142 patients with IBS who met the Rome III criteria.[29] In that study, 60 out of the 142 patients (42%) were found to be poor sleepers according to the Pittsburgh Sleep Quality Index. Moreover, using the unitary bowel-sleep model based on item response theory, the authors of that study reported a strong positive correlation between the severity of IBS symptoms and sleep disturbances. However, we believe that further research is needed to clarify whether the association between IBS and sleep disturbances represents a simple comorbidity in the brain–gut axis milieu or a direct pathophysiological relationship.

In the present study, participants with IBS had significantly higher levels of anxiety than those without IBS (Table 3). Similar results were found in Nigerian medical students and university students in South Korea.[22,26] A recent meta-analysis concluded that the level of anxiety is higher in patients with IBS than in healthy controls.[10] This result is expected as IBS is a stress-sensitive disorder.[30] Stress is a recognized factor that can trigger and/or worsen IBS symptoms. The exact mechanisms by which stress affects IBS remain unclear. However, the negative effect of stress on IBS symptoms is believed to be caused by a disordered gut–brain axis.[30] Therefore, anxiety symptoms should be systematically corroborated and treated in patients with IBS, as psychological factors are important determinants of symptom severity, willingness to seek treatment, and response to therapy. Nevertheless, we believe that longitudinal studies on the effects of psychiatric evaluation and therapy in patients with IBS are warranted.

In contrast, our results showed that, unlike anxiety, depression was not significantly associated with IBS. In agreement with our results, an Egyptian study of 382 medical students (using the HADS) found a statistically significant association between IBS and anxiety, but not depression.[18] Arguably, the association of IBS with depression may be influenced by the IBS subtype: constipation-predominant IBS (IBS-C), diarrhea-predominant IBS (IBS-D), and IBS with mixed bowel habits (IBS-M). In a systematic review and meta-analysis, Fond et al[10] investigated the association between IBS and each of its subtypes with anxiety and/or depression. In their analysis, the authors included 10 case–control studies (885 patients and 1384 healthy controls) and found that patients with IBS had significantly higher anxiety and depression levels than controls. In that study, this significant difference was confirmed for patients with IBS-C and IBS-D subtypes for anxiety, and only in IBS-D patients with depression. In the present study, we did not determine the IBS subtypes in our cases; therefore, an adequate statistical association could not be analyzed.

Concerning the relationship between IBS and study level, second and third-year medical students in the present study were at higher risk compared with first-year and fourth- to sixth-year students. This finding is in agreement with the results of an Iranian study.[31] In that study, IBS was more prevalent in first- and second-year medical students compared in fourth- and fifth-year students. Conversely, a study conducted in the Schulich School of Medicine and Dentistry in Ontario, Canada, did not report a statistically significant difference between preclinical and clerkship medical students with IBS.[32] Arguably, the study level appears to contribute to the prevalence of IBS among medical students. However, a clear trend has not been established between the different levels. Students in their second and third year of study encounter major challenges. These challenges arise from the introduction of students to a new environment with difficult situations aggravated by the nature of integrative modular systems of study during these 2 years. We believe that fear of failure in exams and levels of anxiety increase during this period, thereby leading to a significant increase in the prevalence of IBS. In the present study, the prevalence of anxiety increased among first- to third-year medical students, revealing a total of 68.3% of total anxiety cases compared with 31.7% among their fourth- to sixth-year counterparts ($P = .002$).

This study had some limitations. We used self-administered questionnaires to collect sociodemographic, lifestyle, and clinical characteristics, which may produce a higher proportion of incomplete data than interview surveys. However, we used an interview questionnaire for the diagnosis of IBS, with the advantages of a higher response rate and more accurate information compared to the self-administered diagnostic questionnaire. Another limitation of the present study is that the IBS subtypes were not determined in our cases, leading to the inability to perform subgroup analysis. However, the high response rate and large sample size in our study substantiate the validity of our findings.

It should also be noted that we used the older Rome III criteria to diagnose IBS, rather than the more recent Rome IV criteria, thus allowing us to compare and discuss our results in the light of published studies that used the Rome III criteria to diagnose IBS. On the other hand, because the Rome III criteria tool is more sensitive than the Rome IV criteria, it is arguable that the IBS prevalence found in our study population could be slightly overestimated. We are currently conducting another survey using the Rome IV criteria, and our preliminary analysis shows that the IBS prevalence is slightly lower than that reported in the present study.

In conclusion, this study revealed a high prevalence of IBS among Jordanian medical students. Several modifiable and nonmodifiable risk factors have been associated with IBS. 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 the findings of this study have important implications for national programs aimed at improving academic performance and managing stress among students with IBS. However, longitudinal studies are needed to determine whether this putative association is causal.

Author contributions

Conceptualization: K.J. and M.K.; methodology: K.J., M.K., and E.S.; data collection: E.S., A.S., and B.A.; writing original draft: K.J, M.K., E.S., A.S., and B.A.; writing-review and editing: K.J. and M.K.; formal analysis: M.K.; project administration: K.J.

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