

# Epidemiology of irritable bowel syndrome and its associated factors in Saudi undergraduate students

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## Abstract

**Background/Aim:** Irritable bowel syndrome (IBS) is common among undergraduate students and is associated with several modifiable risk factors. The present study aimed to explore the epidemiology of IBS in Saudi undergraduate students.

**Materials and Methods:** A cross-sectional study was carried out from February 2018 to June 2018. A total of 767 undergraduate students from all regions of Saudi Arabia completed an online self-administered questionnaire. IBS symptoms were assessed using the Rome IV diagnostic criteria.

**Results:** The mean age was 21.88 years (range 18–29); 56.1% of the study population were females and 50.1% were from the central region of Saudi Arabia. Students of medical colleges represented 30.2% of the sample. The overall prevalence of IBS was 15.8%. Significant independent risk factors for IBS were female sex (OR = 3.738; 95% CI = 2.093, 6.673), being a student in a medical college (OR = 7.216; 95% CI = 4.438, 11.733), living in a rented apartment (OR = 6.752; 95% CI = 2.586, 17.627), living on campus (OR = 6.563; 95% CI = 2.138, 20.145), poor sleep quality (OR = 3.156; 95% CI = 1.850, 5.385), exercise (OR = 0.394; 95% CI = 0.193, 0.803), smoking (OR = 5.256; 95% CI = 2.841, 9.724), family history of IBS (OR = 1.641; 95% CI = 1.012, 2.661), and emotional stress (OR = 2.184; 95% CI = 1.375, 3.469).

**Conclusion:** Overall, 15.8% of participants in this study met the Rome IV criteria for IBS diagnosis. IBS was associated with several lifestyle factors, as well as family history and emotional stress.

**Keywords:** Epidemiology, irritable bowel syndrome, risk factors, Saudi Arabia, undergraduate students

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## INTRODUCTION

Irritable bowel syndrome (IBS) is a chronic gastrointestinal condition that is clinically manifested by recurring abdominal pain or discomfort, which is relieved after bowel emptying and associated with changes in bowel habits.<sup>[1]</sup> IBS affects around 10–20% of adults worldwide,<sup>[2]</sup> and tends to be more common in women and adults under 50 years.<sup>[3,4]</sup>

The exact mechanism of IBS remains uncertain, and available mechanisms include abnormal regulation of serotonin, postinfectious IBS, and bacterial overgrowth.<sup>[5]</sup> Twin studies have also suggested a genetic basis of IBS.<sup>[6]</sup> Besides, psychosocial factors have been long thought to predispose individuals to IBS.<sup>[5]</sup>

In the Kingdom of Saudi Arabia (KSA), little is known about the prevalence of IBS, particularly among university

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students.<sup>[7]</sup> Some cross-sectional studies, using Rome III diagnostic criteria, have reported that IBS is common among undergraduate students. For example, reports from Jeddah and Riyadh, KSA found that 31.8% and 21% of medical students, respectively, met the criteria for an IBS diagnosis.<sup>[7,8]</sup> However, IBS prevalence rates are variable, and some factors, including study methods, diagnostic criteria, and sample size, should be taken into consideration. Hasosah *et al.* have estimated the prevalence rate of IBS to be 15.6% among medical students and interns in Jeddah, KSA. In this study, high levels of stress, family history of IBS, and lack of exercise were found to be significant risk factors for IBS.<sup>[9]</sup>

Undergraduate students are exposed to continuous stress due to the duration of their studies and tough exams.<sup>[7]</sup> The high prevalence rate of IBS observed in university students, especially medical students, could be partly explained by the role of stress.<sup>[10]</sup> In 2012, Chu *et al.* conducted a study among science, engineering, and medical students in China. They found that the prevalence of IBS was relatively higher in women and medical students.<sup>[11]</sup>

Individuals with IBS cause more costs for the health care system compared to healthy individuals.<sup>[12]</sup> Low quality of life, the ambiguity of the underlying causes, frequency of symptoms, and coexisting health problems lead to recurrent hospital visits and costly investigations for IBS patients.<sup>[13]</sup> The present study was designed to explore the epidemiology of IBS in a sample of Saudi undergraduate students.

## MATERIALS AND METHODS

This observational cross-sectional survey was conducted in the KSA in the period from February 2018 to June 2018. A total of 767 students from around the KSA were enrolled in the study. All undergraduate students aged 18 years and older were invited to participate in an online questionnaire. Excluded from the study were students who refused to give written informed consent for participation and those who self-reported having the following criteria: inflammatory bowel disease, bloody diarrhea, nocturnal diarrhea, chronic fever, or weight loss (red flag symptoms). The sample size was calculated using the convenience sampling method as we only accepted responses during a period of three months. A total of 767 undergraduate students were enrolled in the study.

Data were collected using a validated, structured, and self-assessment questionnaire. The questionnaire was presented in two parts. The first part included sociodemographic details such as age, sex, college, marital status, and monthly income. Also, participants were asked

about their sleep quality, exercise, stress, family history of IBS, and smoking. The second part included the Arabic version of the Rome IV criteria questionnaire,<sup>[14]</sup> according to which a diagnosis of IBS requires the presence of recurrent abdominal pain/discomfort for at least 1 day/week during the past 3 months for at least 6 months or more duration associated with two or more of the following: (i) the pain is related to defecation; and/or (ii) onset is associated with stool frequency change; and/or (iii) onset is associated with stool appearance change.

Participants had the option to participate and their information was promised to be kept anonymous and confidential. The study was approved by the Institutional Review Board of King Faisal University, Al Ahsa, KSA.

Qualitative and quantitative variables were compared using Pearson's  $\chi^2$  test and student's *t*-test, respectively. Variables with  $P < 0.10$  from the univariate analysis were then entered into a multivariate model to explain the factors associated with the IBS diagnosis. Adjusted odds ratio (AOR) and their 95% CIs were calculated. Associations were considered statistically significant when  $P$  was  $< 0.05$ . The analysis was conducted using the Statistical Package of Social Sciences (SPSS) Version 21 (SPSS Inc., Chicago, IL).

## RESULTS

A total of 767 undergraduate students participated in the present survey, with a mean age of 21.88 (SD 1.99). Female students represented 56.1% of the study sample. It was found that half of the participants (50.1%) were from the central region of the KSA, 21.9 from the western region, 14.7% from the eastern region, 8.0% from the southern region, and 4.4% from the northern region. A total of 232 participants (30.2%) were enrolled in medical colleges that included medicine, applied medical sciences, dentistry, nursing, and pharmacy, and the remaining were from non-medical colleges [Table 1]. The assessment of the Rome IV diagnostic criteria showed that 121 (15.8%) of the study population met the criteria for an IBS diagnosis. Female participants (20.5%) were significantly more affected by IBS than male participants (9.8%,  $P = 0.000$ ). Significant differences were also found between colleges, with students of medical colleges (31.9%) being more affected by IBS than other students (8.8,  $P = 0.000$ ). Analysis of marital status ( $P = 0.007$ ) and monthly income ( $P = 0.009$ ) also showed significant differences.

Comparing the IBS prevalence rate against some lifestyle characteristics and family history of IBS showed that IBS was more commonly present in participants who self-reported having bad sleep quality ( $P = 0.009$ ), lack

exercise ( $P = 0.010$ ), regularly smoke cigarettes ( $P = 0.000$ ), have a positive family history of IBS in a first-degree relative ( $P = 0.032$ ), and emotional stress ( $P = 0.000$ ) [Table 2].

Table 3 summarizes the results of the multiple regression analysis of possible risk factors for IBS in the study population. Significant independent risk factors for IBS were female sex (OR = 3.738; 95% CI = 2.093, 6.673), being a student in a medical college (OR = 7.216; 95% CI = 4.438, 11.733), living in a rented apartment (OR = 6.752; 95% CI = 2.586, 17.627), living on campus (OR = 6.563; 95%

CI = 2.138, 20.145), poor sleep quality (OR = 3.156; 95% CI = 1.850, 5.385), exercise (OR = 0.394; 95% CI = 0.193, 0.803), smoking (OR = 5.256; 95% CI = 2.841, 9.724), family history of IBS (OR = 1.641; 95% CI = 1.012, 2.661), and emotional stress (OR = 2.184; 95% CI = 1.375, 3.469).

## DISCUSSION

This study explored various epidemiological aspects of IBS in 767 Saudi undergraduate students. The sample included college students from different regions of the country who were categorized according to college type into medical and

**Table 1: Distribution of study participants by IBS diagnosis (n=765)**

Characteristics	Total (n=767)		IBS (n=121)		No IBS (n=646)		$\chi^2$ or t-test	P
	n	Percentage	n	Percentage	n	Percentage		
Sex								
Males	337	43.9	33	9.8	304	90.2	16.197	0.000
Females	430	56.1	88	20.5	342	79.5		
Mean age years (SD)	21.88 (1.99)		21.96 (1.87)		21.86 (2.02)		0.513	0.608
Residence region in the KSA								
Central	391	51.0	53	13.6	338	86.4	3.944	0.414
Western	168	21.9	28	16.7	140	83.3		
Northern	34	4.4	7	20.6	27	79.4		
Southern	61	8.0	10	16.4	51	83.6		
Eastern	113	14.7	23	20.4	90	79.6		
College								
Medical	232	30.2	74	31.9	158	68.1	65.054	0.000
Nonmedical	535	69.8	47	8.8	488	91.2		
Marital status								
Single	619	80.7	87	14.1	532	85.9	7.149	0.007
Married	148	19.3	34	23.0	114	77.0		
Living condition								
With parents	637	83.1	95	14.9	542	85.1	4.548	0.103
In a rented apartment	90	11.7	15	16.7	75	83.3		
On campus	40	5.2	11	27.5	29	72.5		
Monthly income								
Enough and exceeds	225	29.3	42	18.7	103	81.3	9.336	0.009
Only enough or not enough	542	70.7	79	21.8	463	85.4		

IBS: Irritable bowel syndrome

**Table 2: Distribution of study participants by lifestyle characteristics, family history, and emotional stress (n=767)**

Characteristics	Total (n=766)		IBS (n=121)		No IBS (n=646)		$\chi^2$	P
	n	Percentage	n	Percentage	n	Percentage		
Sleep quality								
Good	319	41.6	25	7.8	294	92.2	25.905	0.000
Bad	448	58.4	96	21.4	352	78.6		
Exercise								
Yes, regularly	141	18.4	12	8.5	129	91.5	6.730	0.010
No	624	81.6	108	17.3	516	72.7		
Smoking								
Yes, regularly	124	18.4	34	27.4	90	72.6	15.404	0.000
No	641	81.6	86	13.4	555	86.6		
Family history								
Yes	204	26.6	42	20.6	162	79.4	5.099	0.032
No/Don't know	562	73.4	78	13.9	484	86.1		
Emotional stress								
Yes	562	73.4	78	13.9	484	86.1	25.587	0.000
No	322	42	76	23.6	246	76.4		
No	445	58	45	10.1	400	89.9		

**Table 3: Multiple regression analysis: Risk factors for IBS among Saudi undergraduate students**

Risk factors	B	SE	P	OR	95% CI
Males	Ref.				
Females	1.318	0.296	0.000	3.738	2.093 6.673
Non-medical colleges	Ref.				
Medical colleges	1.976	0.248	0.000	7.216	4.438 11.733
Enough income and exceeds	Ref.				
Not enough income	-0.204	0.250	0.414	0.816	0.500 1.330
Living with parents	Ref.				
Living in a rented apartment	1.910	0.490	0.000	6.752	2.586 17.627
Living on campus	1.881	0.572	0.001	6.563	2.138 20.145
Poor sleep quality	1.149	0.273	0.000	3.156	1.850 5.385
Regular exercise	-0.932	0.364	0.000	0.394	0.193 0.803
Smoking	1.659	0.314	0.000	5.256	2.841 9.724
Family history of IBS	0.495	0.247	0.045	1.641	1.012 2.661
Emotional stress	0.781	0.236	0.001	2.184	1.375 3.469

OR: Odds ratio; CI: Confidence interval

non-medical students. The overall prevalence rate of IBS in the study population was 15.8%, which is consistent with what has been reported by international and local studies.<sup>[7,8]</sup> Globally, around 10–20% of adults are affected by IBS.<sup>[3,4]</sup> In Saudi Arabia, similar findings were reported by Hasosah *et al.*, who found that 15.6% of medical students in the city of Jeddah have IBS according to the Rome III criteria.<sup>[9]</sup> No significant difference in the IBS prevalence rate was found between participants from different KSA regions. This is possibly due to similar lifestyle characteristics in this particular age group (i.e., 18–30 years) in all KSA regions.

Our data revealed that the prevalence of IBS was higher among females than among males, with a female to male ratio of 1.27:1. This is in agreement with previous reports that found a female predominance in IBS prevalence.<sup>[3,4,15]</sup> In a systemic review and meta-analysis of 55 studies including 162,543 subjects, women showed a higher prevalence of IBS than men.<sup>[16]</sup> Possible explanations for this difference include physiologic differences and different medical care-seeking behaviors.<sup>[17]</sup>

IBS is most commonly reported to be higher among medical students than among students of other colleges, possibly due to stressful medical students' lifestyles.<sup>[8,10]</sup> In the current study, students of medical colleges were 7.2 times more likely, than non-medical students, to meet the criteria for an IBS diagnosis. These findings indicate the need for interventional studies that address this epidemiologic picture. Offering medical counseling for medical students may help in relieving their stress and, possibly, their IBS symptoms.

Cigarette smoking in our study was an independent risk factor for IBS (OR = 5.256; 95% CI = 2.841, 9.724). The relationship between cigarette smoking and IBS has been

reported to be inconsistent in the literature. Our findings are supported by some observational studies that showed that cigarette smoking was associated with a higher IBS prevalence.<sup>[18,19]</sup>

Heredity plays an important role in IBS development.<sup>[20,21]</sup> In this study, having a first-degree relative with IBS was significantly associated with IBS symptoms.

Emotional stress was common in participants with IBS and significantly predicted IBS prevalence. The role of stress in IBS is well-established. Evidence from clinical and experimental studies showed that emotional stress significantly impacts intestinal sensitivity, secretion, motility, and permeability, and the underlying mechanism correlates with activation of mucosal immunity, alterations in central and peripheral neurons, and gastrointestinal microbiota. As a result of stress, alterations in neuroendocrine-immune pathways act on the gut-brain axis and cause or exaggerate symptoms of IBS. IBS is a stress-sensitive condition; therefore, treatment methods should focus on managing stress and stress-induced responses.<sup>[22]</sup>

Good night sleep and regular exercise are essential components of everyday life. As many as 50% of individuals with IBS have sleep disturbances.<sup>[23]</sup> While IBS symptoms can potentially have a harmful effect on the restorative sleep pattern, recent data suggest that sleep disruption may directly impact GI symptoms and visceral sensitivity.<sup>[24]</sup> Moreover, regularly exercised emerged in the current analysis as a protective factor against IBS symptoms, with students who being 19% less likely to have IBS symptoms compared to students with sedentary lifestyles (OR = 0.394; 95% CI = 0.193, 0.803). These results, namely, poor sleep quality, lack of exercise, living away from family, and smoking, further support the notion that IBS is a multifactorial process that is precipitated by environmental factors in those who have a genetic susceptibility.<sup>[25]</sup>

## CONCLUSION

In conclusion, 15.8% of participants in this study met the Rome IV criteria for IBS diagnosis. Risk factors for IBS included female sex, being a student in a medical college, living in a rented apartment, living on campus, poor sleep quality, exercise, smoking, family history of IBS, and emotional stress. Interventional studies are required to explore possible solutions for the high prevalence of IBS, given that much of the risk factors are modifiable.

A limitation of the present study is the use of a self-administered questionnaire which may result in a

higher frequency of missed and inaccurate data than in an interview-based study. Also, as subjects were recruited through social media in a specific period of time, the current sample may not be representative of all Saudi undergraduate students as it neglects students who were socially inactive due to exams, vacations, or personal reasons.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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