

# Irritable bowel syndrome among paramedical students, King Abdulaziz University, Jeddah, Saudi Arabia

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## Abstract

**Aim:** The study was done to determine the prevalence and associated factors of IBS among paramedical students at King Abdulaziz University, Jeddah, Saudi Arabia.

**Methods:** A cross-sectional study was done during 2016/2017 at the Faculty of Health Sciences, King Abdulaziz University, Jeddah. A multistage stratified random sample method was used to select 525 paramedical students. A standardized self-administered data collection sheet was used and contained the validated scales of Rome III Criteria, Hospital Anxiety and Depression Scale (HADS) and Pittsburgh Sleep Quality Index (PSQI).

**Results:** One-third of the paramedical students met the Rome-III criteria of IBS. Nursing and dentistry students had higher IBS prevalence compared to others. IBS-Mixed and IBS-Constipation were the commonest sub-types. IBS was associated with female gender, educational specialty, family history of IBS, family income, chronic medical conditions, food hypersensitivity, traveler's diarrhea, poor sleep quality, stress, anxiety, and depression. Regression analysis revealed that female gender (aOR: 1.83; 95% CI: 1.12-3.28), stress, depression, IBS family history and poor sleeping were IBS predictors after controlling of confounding factors.

**Conclusion:** The prevalence of IBS was high among paramedical students, and it was predicted by gender, stress, depression, poor sleeping, and family history. Screening for IBS and psychological problems, stress management courses and IBS educational programs are recommended for paramedical students.

## Introduction

Irritable bowel syndrome (IBS) is a global, wide-spreading, costly and disabling chronic Functional Gastrointestinal Disorder (FGID). It is the most frequently diagnosed type of the FGIDs, and the commonest reason for visiting gastroenterologist [1,2]. The condition is manifested by alteration of bowel habits (diarrhoea and constipation), abdominal pain and bloating, in absence of chemical or pathological disorders and other red flags. IBS is a sensory-motor illness, with a multi-factorial aetiology. Motility disorders, alteration of the gut mucosal immune activity, visceral hypersensitivity, central processing dysfunctions, psychological factors, and infections play roles in IBS aetiology [1,3,4].

IBS is associated with somatic co-morbidities (as over-active bladder, migraine and painful syndromes). Similarly, it can be associated with visceral sensitivity and psychological conditions (anxiety and depression). Furthermore, many physiological, psychological and stresses factors can play a role in severity of IBS symptoms. Stresses usually worsens gastrointestinal symptoms [5]. IBS condition can be only diagnosed clinically; as no biomarkers or confirmative investigations available for it [1,2].

It was estimated in 2014 that about 11% of the global population are affected by IBS [6]. A study done between university students from Lebanon revealed that more than half of the diagnosed students with IBS were enrolled in the Faculty of Medical Sciences (Medicine, Pharmacy, and Dentistry) [7]. Ibrahim et al. [8] reported that IBS affected 31.8% of medical students and interns from the main governmental medical college in Jeddah, Saudi Arabia. Students enrolled in faculties working in the medical fields are usually exposed to various stressors such as

academic stresses and an uncertain future. They also represent a large and important sector of the future health team [1,8].

However, insufficient number of studies had been conducted to illustrate the problem of IBS between paramedical students in Jeddah. So, such study is needed. The current study was done to determine the prevalence and associated factors of IBS between paramedical students at King Abdulaziz University (KAU), Jeddah, Saudi Arabia.

## Methods

The study was done using a cross-sectional approach during 2016/2017. It was done among paramedical students enrolled in faculties of Nursing, Dentistry and Applied Medical Sciences (Nutrition, Physiotherapy & Laboratory specialties). A multistage stratified random sample method was used during 2015/2016. Stratification considered the gender, educational level, faculty and specialty. All those who finished freshman year and accepted to participate enrolled in the study.

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## The sample was calculated according to the equation [9]

$$n = Z^2 \times P \times q$$

d2

Prevalence (p) was set as 31.8%; based on to the latest study from Jeddah.<sup>8</sup> The minimal sample that was needed for achieving a precision of  $\pm 4\%$  at 95% confidence interval (CI) amounted to 521 participants, which was rounded to 525.

A constructed, validated, data collection sheet was utilized. Face and content validity were assessed by 2 experts. Internal-consistency reliability was found to be 81%.

Personal, socio-demographic information, lifestyles, stresses during the six-months preceded the study, and family history of IBS were determined. Students were also asked about prior diagnosis of IBS and other chronic medical conditions including traveler's diarrhoea. Weight and height of the students were assessed. Rome III criteria was utilized to identify IBS cases, and its sub-types [10]. Students also completed the standardized version of the Hospital Anxiety and Depression Scale (HADS) [11] and the Food Frequency Questionnaire (FFQ). Pittsburgh Sleep Quality Index (PSQI) [12] was completed. All the used scales have high validity and internal consistency reliability [10-12].

## Statistical analysis

Data was analysed by SPSS Version 20. Different scores were calculated as followings:

**Rome III criteria** was used to classify the participants into those who met IBS criteria or not. It then divided the detected IBS cases according to their sub-types into IBS-Constipation (IBS-C), IBS-Diarrhoea (IBS-D), IBS-Mixed (IBS-M) and IBS-Unsub-typed (IBS-U) [10].

**Body Mass Index (BMI):** It was calculated (Weigh in kilogram/Height<sup>2</sup> in meter<sup>2</sup>), and then it was categorized into: normal weight or excessive weight (over-weight and obese) [8].

**Hospital Anxiety and Depression (HADS):** A self- rating scale of 14 items; 7 items for anxiety HADS-Anxiety (HADS-A) and 7 for HADS- depression (HADS- depression). It was then categorized into normal (from 0-7), borderline case (from 8-10) and abnormal (from 11-21). Then it was divided into either normal or abnormal [11].

**PSQI:** It consists of 19 items; which is grouped into seven components. Participants who obtained a score higher than 5 were then considered poor sleepers [12].

Descriptive and inferential statistics were done. A multiple logistic regression model was constructed to determine IBS predictors after controlling confounding. Adjusted Odds Ratio (aOR), and 95% confidence Intervals (CI) were calculated. All *p*-values<0.05 were considered statistically significant.

**Ethical statement:** The study followed the ethical standards of Helsinki Declaration. Approval of conduction of the research was taken from the Ethics and Research Committee of KAU. A written informed consent was obtained from each participant.

## Results

A total of 525 paramedical students enrolled in the study. Their age ranged from 18-28 years with a mean of  $21.38 \pm 2.09$ . Analysis of PSQI revealed that the prevalence of poor sleep quality among all paramedical students was 68.6%.

Table 1 illustrates that 33.3% of the paramedical students met Rome-III criteria for IBS diagnosis. IBS-Mixed (IBS-M) was the commonest (58.9%) prevalent sub-type. On the other hand, IBS-Constipation (IBS-C), IBS- Unsubtyped (IBS-U), and IBS-Diarrhoea (IBS-D) accounted for 15.4%, 14.3% and 11.4% of the cases, respectively. Out of 175 cases diagnosed as IBS in the current analysis, only 42 students (24.0 %) were previously diagnosed as having IBS by physician (s).

**Table 2** illustrates that the prevalence of IBS was much higher among females (38.1%) compared to males (20.8%). A highly statistical significant difference was present ( $X^2=13.95$ ,  $p<0.0001$ ). Regarding educational specialty, nursing (41.7%) and dentistry (37.8%) students had the highest IBS prevalence compared to others. On the other hand, students from the nutritional specialty had the lowest prevalence. IBS was significantly associated with family history of the condition ( $p<0.001$ ). Older students and those lived in the university dorms had higher IBS prevalence than others ( $p>0.05$ ).

It is apparent from table 3 that IBS was significantly associated with presence of chronic medial diseases ( $OR=2.19$ ; 95% CI: 1.33-3.61). It is also associated with traveler's diarrhea. In addition, participants who had food hypersensitivity reported a significantly higher prevalence of IBS (45.1%) compared to others (31.5%). Students who faced stress, during the six months preceded the study, were about 2.5 times more prone to IBS compared to others ( $OR=2.19$ ; 95% CI: 1.33-3.61). Furthermore, IBS was higher among students diagnosed as having border-line and morbid anxiety (HAS-A) compared to normal students ( $p<0.05$ ). Similarly, IBS prevalence was significantly higher (42.2%) among students with borderline and morbid depression (HAS-D) compared to others (27.4%). Poor sleepers were about 2 times more liable to IBS than others ( $OR=1.94$ ; 95% CI: 1.33-2.83). Smokers, those with higher BMI, and those didn't practice physical exercise had higher prevalence of IBS compered to others, but without statistical significant differences ( $p>0.05$ ).

Analysis of FFQ showed that there are no associations between different dietary intake and IBS.

Controlling confounding factors in logistic regression analysis (Table 4) reveals that gender (female) was the first predictor of IBS (aOR: 2.11; 95% CI: 1.30-3.41). Stress during the six months preceded the study (aOR:1.83; 95% CI: 1.12-3.28), diagnosis of depression (aOR: 1.74; 95% CI: 1.12-2.36). Presence of family history of IBS (aOR: 1.64; 95% CI: 1.11-2.36), and poor sleep quality (aOR: 1.57; 95% CI: 1.05-2.35) were the following IBS predictors.

**Table 1.** Prevalence, subtypes of IBS among paramedical students at King Abdulaziz University.

Irritable bowel syndrome	Number	Percent
No Irritable Bowel syndrome	350	66.6
Irritable Bowel syndrome	175	33.3
Total	525	100
<b>Types of IBS (Total=175)</b>		
IBS- Mixed (IBS-M)	103	58.9
IBS-Constipation (IBS-C)	27	15.4
IBS Unsubtyped (IBS-U)	25	14.3
IBS-Diarrhea (IBS-D)	20	11.4
<b>Previously diagnosed by a physician as IBS</b>		
Yes	42	24
No	133	76
Total IBS diagnosed cases	175	100

**Table 2.** Relationship between personal, socio-demographic factors, family history and irritable bowel syndrome among paramedical students at King Abdulaziz University. N.B.: RC: Referent category.

Variable	IBS	No-IBS	X <sup>2</sup>	P	OR	95% CI
	(No. =175) No. %	(No. =350) No. %				
<b>Age</b>						
≤ 20	53 (29.3)	128 (70.7)	0.062	0.15	0.75	0.51-1.11
>20	122 (35.5)	222 (64.5)				
<b>Gender</b>						
Female	145 (38.1)	236 (61.9)	13.95	0	2.33	1.49-3.67
Male	30 (20.8)	114 (79.2)				
<b>Educational specialty</b>						
Nursing	30 (41.7)	42 (58.3)			3.57	1.57-8.15
Dentistry	37 (37.8)	61 (62.2)			3.03	1.37-6.69
Laboratory	31(36.0)	55 (64.0)			2.82	1.25-6.33
Physiotherapy	34 (33.0)	69 (67.0)	11.13	0.04	2.46	1.11-5.45
Pharmacy	33 (31.1)	73 (68.9)			2.26	1.02-4.99
Nutrition	10 (16.7)	50 (83.3)			1 <sup>RC</sup>	
<b>Income</b>						
Enough & exceeds	83 (29.1)	202 (70.9)	4.55	0.03	0.67	0.47-0.96
Enough only or debt	91 (52.3)	149 (42.5)				
<b>Living place</b>						
With family	158 (33.0)	321 (67.0)	0.514	0.77	0.7	0.26-1.88
Private dorm	10 (34.5)	19 (65.5)			0.75	0.22-2.58
University dorm	7 (41.2)	10 (58.8)			1 <sup>RC</sup>	
<b>Family History of IBS</b>						
Yes	62 (48.1)	67 (51.9)	16.69	0	2.32	1.54-3.49
No	113 (28.5)	283 (71.5)				

**Table 3.** Relationship between life-style, chronic conditions, psychological problems and irritable bowel syndrome among paramedical students at King Abdulaziz University.

Variable	IBS	No IBS	X <sup>2</sup>	P	OR	95% CI
	(No. %)	(No. %)				
<b>Physical exercise</b>						
Practice	91 (34.2)	175 (65.8)	0.19	0.67	1.08	0.75-1.56
Not practice	84 (32.4)	175 (67.6)				
<b>Smoking</b>						
Yes	19 (41.3)	27 (58.7)	1.44	0.23	1.46	0.79-2.70
No	156 (32.6)	323 (67.4)				
<b>BMI</b>						
Normal	149 (32.7)	306 (67.3)	0.53	0.468	0.82	0.49-1.39
Overweight & obese	26 (37.1)	44 (62.9)				
<b>Chronic diseases</b>						
Yes	36 (49.3)	37 (50.7)	9.75	0.002	2.19	1.33-3.61
No	139 (30.8)	313 (69.2)				
<b>Food hypersensitivity</b>						
Yes	32 (45.1)	39 (54.9)	5.09	0.024	1.78	1.07-2.97
No	143 (31.5)	311 (68.5)				
<b>Traveler's diarrhea</b>						
Yes	35 (47.9)	38 (52.1)	8.15	0.004	2.05	1.24-3.39
No	140 (31.0)	312 (69.0)				
<b>Sleeping quality</b>						
Poor sleep	116 (39.7)	176 (60.3)	12.09	0.001	1.94	1.33-2.83
Good sleep	59 (25.3)	174 (74.7)				
<b>Stress</b>						
Yes	112 (42.9)	149 (57.1)	22.35	0	2.45	1.68-3.57
No	62 (23.5)	202 (76.5)				
<b>Anxiety</b>						
Borderline & Morbid	91 (38.6)	145 (61.4)	5.27	0.02	1.53	1.06-2.21
Normal	84 (29.1)	205 (70.9)				
<b>Depression</b>						
Borderline & morbid	89 (42.2)	122 (57.8)	12.43	0	1.93	1.34-2.79
Normal	86 (27.4)	228 (72.6)				

**Table 4.** Predictors of irritable bowel syndrome among paramedical students from King Abdulaziz University. aOR: Adjusted Odds Ratio.

Variable	B	p	aOR	95.0% CI
Gender (female)	0.744	0.002	2.11	1.30-3.41
Stress	0.606	0.003	1.83	1.12-3.28
Depression (morbid & borderline)	0.553	0.01	1.74	1.12-2.63
Family history of IBS	0.494	0.03	1.64	1.11-2.63
Sleep quality (poor)	0.452	0.02	1.57	1.05- 2.35
Constant			-3.865	

## Discussion

Up to the best of our knowledge, and based on extensive literature search, the current study may be the first study done about IBS among a large sample of paramedical students from both gender and all grades in Jeddah, KSA.

Our results illustrated that one-third of the paramedical students had IBS, which agrees with the study of Ibrahim et al. [8] from Jeddah. Correspondingly, the prevalence of IBS among students from nursing and medical colleges from China (32.1%) [13] and Japan (35.5%) [14]. On the other hand, a lower prevalence of IBS (21.1%) was reported among 57 nursing and midwifery students from Iran [15]. This discrepancy may be attributed to the smaller sample size from Iran, or because their sample included nursing and midwifery students who may be have less stress, or due to the variations between countries.

Paramedical students who were previously diagnosed as having IBS represented only 24.0% of those who met Rome III in the current study. This finding is in line with many other previous studies [8,16,17]. The present study revealed that IBS-M and IBS-C were the commonest sub-types. This finding coincides with other studies from Pakistan [10] Saudi Arabia [16] and Egypt [18].

Females in the present study had higher rates of IBS than males, and gender was the first predictor of the condition. This result agrees with the pre-determined association between gender and IBS [1,7,8,10,14,18]. This gender difference may be explained by the effect of "Microgenderome" which is related to the possible role of sex-hormones (especially estrogen) on modulation of the gut microbiota, and due to their effects on the peripheral and central regulatory mechanisms of the brain-gut axis. This gender difference may also be due to the differences in responses of both genders to stress [1,19].

Regarding the educational speciality, the highest IBS prevalence was found among nursing and dentistry students. This may be because they may face more stresses compared to others due to their clinical workload, and their dealing with patients. However, students studied clinical nutrition had the lowest IBS prevalence compared to others. This might be due to the nature of their study; with nutritional education about diet and relation to diseases as IBS.

Older students, and those enrolled in higher educational grades in our study were diagnosed to have a more prevalence of IBS compared to others. This may be due to increased study load and stressors during their higher educational levels. Our result agrees with the study of Jeddah [8].

Furthermore, participants with enough and exceeding family income, in the current study, had a lower prevalence of IBS than others, which agree with numerous other studies [7,16,18]. This finding may have attributed to the "hygiene hypothesis" and its role in IBS [7].

Students lived with their family had a lower IBS prevalence compared to others ( $p>0.05$ ), which is in line with other studies

[7,8,17]. Living away from family may affect students' lifestyle, decrease their ability to manage stresses, and so become more prone to IBS [7].

IBS prevalence was higher among smokers compared to others in the current study ( $p>0.05$ ). This agrees with Jeddah study [8]. This can be explained by direct effect of nicotine on gut or being a marker for unfortunate psychological condition [1].

Okami et al. [14] reported absence of an association between practicing physical exercise and IBS, which coincides with our results. Paramedical students who had excessive weight (higher BMI) in our study reported higher IBS prevalence compared to others ( $p>0.05$ ), which agrees with results from other studies [8,16].

In the current study, participants with positive family history of IBS were more likely to have IBS, which coincides with other studies [7,8]. It goes in line also with familial aggregation of IBS cases. Results of twin studies support involvement of genetic risk factors in the pathogenesis of IBS [20].

The enteric nervous system is very sensitive to emotional stresses. Negative emotions can cause alteration of intestinal motor function and might cause IBS symptoms [15]. Similarly, our participants who faced stresses during the six months preceded the study were about twice more likely to have IBS than others. Medical and paramedical students usually face stressful life situations due to their extended times of intensive physical and mental function under high pressure [1]. Lee et al. [21] reported also that stress was associated with IBS. A strong association was reported between mental strains and IBS among university students from Germany [22].

Our results revealed presence of significant associations between IBS with each of anxiety and depression. Depression is also one of IBS predictors. Naeem et al. [10] reported also higher anxiety and depression scores between medical students with IBS from Karachi, Pakistan. Similarly, results of a systematic review and meta-analysis included 10 case-control studies, 2014, illustrated that IBS patients had significantly higher levels of anxiety and depression compared to controls [23]. These findings also agree with the results of many other studies [8,10,14]. All these findings can be explained by "the bio-psychological model of IBS, with disruption of the brain-gut pathways" [23].

Our research found that poor sleepers were about twice times more likely to have IBS compared to others. Poor sleep quality may be considered as a risky stressful influence that can disturb the normal biological rhythm, and hence changing the gut motility [1,16]. This finding coincides with the results from two previous studies from Jeddah [8,16].

Our participants who had chronic medical conditions were more prone to IBS, which agrees with the results of a systematic review done for studies done between medical students [1].

IBS was found to be associated with history of traveler's diarrhea in our bivariate analysis. Results from a previous meta-analysis, 2015, illustrated presence of a strong association between traveler's diarrhea and Post-infection IBS (PI-IBS) [24]. This can be explained by disruption of gut microbiota due to the infection [25].

Our study revealed that IBS prevalence was higher between participants who had food hypersensitivity compared to others. Many other studies highlighted the association between food intolerance and symptoms of IBS [8,26,27]. It was reported from a previous Turkish case-control research that the skin prick tests positivity was more common, and the mean IgE values were higher among IBS cases compared to the controls [26].

## Conclusion

One-third of paramedical students were diagnosed as having IBS (Rome III), which is considered a high IBS prevalence. IBS-M and IBS-C were the commonest sub-types. IBS was associated with gender, educational specialty, income, family history of IBS, presence of chronic conditions, food hypersensitivity traveler's diarrhea, poor sleeping, stress, anxiety and depression. After controlling confounding, the predictors of IBS were gender, stresses, depression, poor sleeping and family history of IBS. Screening and management of psychological problems is important. Conduction of stress management and IBS educational programs are recommended. Conduction of similar studies among other health professionals is needed.

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