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Irritable Bowel Syndrome among Paramedical Students, King Abdulaziz University, Jeddah, Saudi Arabia

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Authors' contributions

This work was carried out in collaboration between all authors. Author NKI designed the study, performed the statistical analysis, participated in literature searches, wrote the final paper and is the corresponding author of the manuscript. Authors SMAJ, NMA, AAA, DAB, AMAB and TTF conducted the data collection, participated in data analysis, managed the literature searches and wrote the first draft of the paper. All authors read and approved the final manuscript.

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ABSTRACT

Aim: The study was done to determine the prevalence and associated factors of Irritable Bowel Syndrome (IBS) among paramedical students from faculties of Nursing, Dentistry, Pharmacy, and Applied Medical Sciences, King Abdulaziz University (KAU), Jeddah, Saudi Arabia.
Methods: A cross-sectional study was done during at KAU during the academic year 2016/2017. A multistage stratified random sample method was used. A total of 525 paramedical students were selected. A standardized self-administered data collection sheet was used. It contained the validated scales of Rome III Criteria, Hospital Anxiety and Depression Scale (HADS) and Pittsburgh Sleep Quality Index (PSQI).

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Results: One-third of the paramedical students were diagnosed as having IBS, based on Rome-III criteria. Nursing and dentistry students had a higher prevalence of IBS than others. IBS-Mixed (IBS-M) and IBS-Constipation (IBS-C) were the commonest sub-types. In bivariate analysis, IBS was significantly associated with female gender, the educational specialty, positive family history of IBS, family income, presence of chronic medical conditions, food hypersensitivity, traveler's diarrhea, poor sleep quality, stress, anxiety, and depression. After controlling of confounding factors, logistic regression analysis revealed that female gender (aOR: 1.83; 95% CI: 1.12-3.28) was the first predictor of IBS, followed by exposure to stress, depression, family history of IBS and poor sleep quality.

Conclusion: The prevalence of IBS was relatively high among the paramedical students from KAU. IBS was predicted by gender, presence of stress, depression, poor sleeping, and family history. Screening for IBS and psychological problems is required. Conduction of stress management courses, and IBS educational programs are recommended for paramedical students.

Keywords: Irritable bowel syndrome; stress; depression; sleep quality; paramedical students.

1. 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. IBS was estimated to affect from 10% to 22% of the adult population [1,2,3]. The condition is manifested by alteration of the 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 which has multi-factorial aetiological factors. Motility disorders, alteration of the gut mucosal immune activity, visceral hypersensitivity, central processing dysfunctions, psychological factors, and infections play roles in IBS aetiology [2,4,5].

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 [6].

IBS can be only diagnosed clinically as there is no biomarkers or confirmative investigations available for its diagnosis [2,3]. Rome III criteria is a reliable tool for diagnosis of IBS. It is completed through a self-reported questionnaire. The classification system of cases is essentially based on the symptom clusters that remain consistent across clinical and population groups. [7] Rome III Criteria can reasonably diagnose IBS, in non-existence of the red flag symptoms. "The sensitivity of Rome III Criteria in the absence of red flag symptoms is 65%, specificity is 100%, the positive predictive value is 100%, and the negative predictive value is 76%. IBS was defined according to Rome III criteria as having recurrent abdominal pain or discomfort for at least 3 days per month during the past 3 months, associated with two or more of the following features: improvement with defecation; and/or onset associated with a change in frequency of stool; and/or onset associated with a change in form (appearance) of stool" [8].

It was estimated in 2014 that about 11% of the global population are affected by IBS. [9] A study was 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) [10]. Ibrahim, et al. reported that IBS affected 31.8% of medical students and interns from the main governmental medical college in Jeddah, Saudi Arabia [8]. 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 [2,8]. However, there is lack of studies done to illustrate the problem of IBS among paramedical students from 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.

2. METHODS

A cross-sectional study was done among paramedical students enrolled at KAU, during the

academic year 2016/2017. The study included students who finished the freshman year, accepted to participate in the study, from faculties of Nursing, Dentistry, Pharmacy and Applied Medical Sciences (Clinical Nutrition, Physical Therapy & Laboratory specialities). A multistage stratified random sample method was used. Stratification considered the gender, educational level, faculty and specialty.

The sample was calculated according to the equation [11]:

$$"n= \frac{Z^2 \times P \times q"}{d^2}$$

The prevalence (p) was set as 31.8%; based on to the latest study from Jeddah [8]. The minimal calculated sample size that was needed for achieving a precision of ± 4%, at 95% confidence interval (CI) was 521 participants. It was rounded to 525 students.

A pre-constructed, validated, anonymous, self-administered data collection sheet was utilized. Face and content validity were assessed by 2 experts. Internal-consistency reliability was found to be 81% by Cronbach's alpha. The data collection sheet asked about personal, socio-demographic status, and the lifestyle. Exposure to stress during the six-months preceding the study, and presence of family history of IBS were determined. Students were also asked about prior diagnosis of IBS by physician (s), and about other chronic medical conditions (including traveler's diarrhoea). Rome III criteria was utilized to identify IBS cases, and classified detected cases into sub-types [12]. Students also completed the standardized version of the Hospital Anxiety and Depression Scale (HADS) [13], and Food Frequency Questionnaire (FFQ). Pittsburgh Sleep Quality Index (PSQI) [14] was included in the data collection sheet. All the used scales have high validity and internal consistency reliability [12,13,14].

The weight and height of the students were also assessed.

2.1 Statistical Analysis

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

1. **Rome III criteria:** It was used to classify the participants into those who met IBS criteria, or not. It was then divided the detected IBS cases according to their sub-types into either IBS-Constipation (IBS-C), IBS-Diarrhoea (IBS-D), IBS-Mixed (IBS-M) and IBS-Unsub-typed (IBS-U) [12].
2. **Body Mass Index (BMI) [8]:** BMI was calculated by the equation of weight (kg) / height^2 (m^2). Students were then categorized according to their BMI into either being normal weigh or having an excessive weight (both over-weight and obese).
3. **Hospital Anxiety and Depression (HADS) [13]:** It is a self- rating scale that consists of 14 items; 7 items for anxiety HADS-Anxiety (HADS-A) and 7 for HADS-depression (HADS-D) [13,15]. According to the scale, students were categorized into either normal (from 0-7), borderline (from 8-10) and abnormal (from 11-21). Then it was divided into either normal or abnormal.
4. **PSQI [14]:** It consists of 19 items that is grouped into seven components. Participants who obtained a PSQI score higher than 5 were then considered as having poor sleep quality.

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

2.2 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.

3. RESULTS

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

Table 1 illustrates that one-third (33.3%) of the paramedical students met the Rome-III criteria for IBS diagnosis. IBS-Mixed (IBS-M) was the

commonest (58.9%) prevalent subtype of IBS. 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 IBS cases, respectively. Out of 175 cases who were diagnosed as IBS cases in the current analysis, only 42 students (24.0%) were also 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 ($X2$= 13.95, p < 0.0001). Regarding the educational specialty, students enrolled in faculty of nursing (41.7%) and dentistry (37.8%) had the highest prevalence of IBS compared to others. On the other hand, students from the nutritional specialty (Faculty of Applied Medical Sciences) had the lowest prevalence of the condition. IBS was significantly associated with presence of positive family history of the disease (p <0.001). Older students and those lived in the university dorms had higher IBS prevalence compared to others. However, there was no statistical significant difference (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 was also associated with traveler's diarrhea. In addition, participants who had food hypersensitivity reported significantly higher prevalence of IBS (45.1%) compared to others (31.5%). Students who faced stress, during the six months preceding 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 who were 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 susceptible to have IBS compared to others (OR= 1.94; 95% CI: 1.33-2.83). Smokers, those with higher BMI, and those didn't practice physical exercise had a higher prevalence of IBS compered to others, but without statistical significant differences (p > 0.05).

Analysis of FFQ showed absence of statistical associations between different dietary intake & IBS.

After controlling confounding factors in logistic regression analysis, it was found that female gender was the first predictor of IBS (aOR: 2.11; 95% CI: 1.30-3.41). Exposure to stress during the six months preceding the study (aOR: 1.83; 95% CI: 1.12-3.28) and having depression (aOR: 1.74; 95% CI: 1.12-2.36) were the next IBS predictors. 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 4).

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
Types of IBS (Total=175 cases)		
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
Previous diagnose of IBS be physicians		
Yes	42	24.0
No	133	76.0
Total IBS diagnosed cases	**175**	**100.0**

Table 2. Relationship between personal, socio-demographic factors, family history and irritable bowel syndrome among paramedical students at King Abdulaziz University

IBS / Variable	IBS (No. =175) No.	%	No-IBS (No. =350) No.	%	*X2*	*P*	*OR*	95% CI
Age								
≤ 20	53 (29.3)		128 (70.7)		0.062	0.15	0.75	0.51-1.11
>20	122 (35.5)		222 (64.5)					
Gender								
Female	145 (38.1)		236 (61.9)		13.95	0.000	2.33	1.49-3.67
Male	30 (20.8)		114 (79.2)					
Educational specialty								
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
Diagnostic Laboratory	31(36.0)		55 (64.0)		11.13	0.04	2.82	1.25-6.33
Physical Therapy	34 (33.0)		69 (67.0)				2.46	1.11-5.45
Pharmacy	33 (31.1)		73 (68.9)				2.26	1.02-4.99
Clinical Nutrition	10 (16.7)		50 (83.3)				1RC	
Income								
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)					
Living place								
With family	158 (33.0)		321 (67.0)		0.514	0.77	0.70	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 RC	
Family History of IBS								
Yes	62 (48.1)		67 (51.9)		16.69	0.000	2.32	1.54-3.49
No	113 (28.5)		283 (71.5)					

N.B.: RC: Referent category

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

IBS / Variable	IBS No. %	No IBS No. %	*X2*	*P*	*OR*	95% CI
Physical exercise						
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)				
Smoking						
Yes	19 (41.3)	27 (58.7)	1.44	0.23	1.46	0.79-2.70
No	156 (32.6)	323 (67.4)				
BMI						
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)				
Chronic diseases						
Yes	36 (49.3)	37 (50.7)	9.75	0.002	2.19	1.33-3.61
No	139 (30.8)	313 (69.2)				
Food hypersensitivity						
Yes	32 (45.1)	39 (54.9)	5.09	0.024	1.78	1.07-2.97
No	143 (31.5)	311 (68.5)				
Traveler's diarrhea						
Yes	35 (47.9)	38 (52.1)	8.15	0.004	2.05	1.24-3.39
No	140 (31.0)	312 (69.0)				

Sleeping quality						
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)				
Stress						
Yes	112 (42.9)	149 (57.1)	22.35	0.000	2.45	1.68-3.57
No	62 (23.5)	202 (76.5)				
Anxiety						
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)				
Depression						
Borderline & morbid	89 (42.2)	122 (57.8)	12.43	0.000	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

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			

B: Regression coefficient
aOR: Adjusted Odds Ratio

4. 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, Saudi Arabia.

Our results illustrated that one-third of the paramedical students were diagnosed as having IBS, based on Rome III criteria. Ibrahim, et al. [8] reported a similar prevalence (31.8%) among medical students from the same university. Similar findings were obtained also among nursing and medical students from China (32.1%) [13] and Japan (35.5%) [16,17]. On the other hand, a lower prevalence of IBS (21.1%) was reported between 57 nursing and midwifery students from Iran [18]. This discrepancy between the current study and the Iranian one may be attributed to their smaller sample size, or because their study population included nursing and midwifery students; who may be less exposed to the academic stress like paramedical students. This difference may be also attributed to the variations between both countries.

Paramedical students who reported that they were previously diagnosed as having IBS by physician (s) represented only 24.0% of those who met the Rome III in the current study. This finding is in line with many other previous studies [8,19,20]. Such low rate of diagnosis indicates the importance of conduction of IBS screening among students exposed to stress like paramedical students.

The present study revealed that IBS-M and IBS-C were the commonest sub-types. This finding coincides with results of other studies conducted in Pakistan [12], Saudi Arabia [19], and Egypt [21].

Females in the present study had a higher prevalence of IBS compared to males, and the gender was the first predictor of the condition. This result agrees with the pre-determined association between gender and IBS [2,8,10,12, 17,21]. 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 because of the effects of these hormones on the peripheral and central regulatory mechanisms of the brain-gut axis. This gender difference may also be due to the differences in responses to stress between both genders [2,22].

Regarding the educational speciality, the highest IBS prevalence was found among nursing and dentistry students. This may be attributed to their

exposure to more educational stresses compared to others. This can be due to their clinical workload, and their dealing with patients. On the other hand, students from the clinical nutrition speciality had the lowest IBS prevalence. This finding might be due to the nature of their study. Their curriculum contains subjects about nutritional education which may allow them to know more about diet, its relation to diseases like IBS, and how to control stress and other factors which may have a role in IBS pathogenesis.

In the current study, older students, and those enrolled in the higher educational grades had a higher prevalence of IBS compared to others. This may be attributed to more study load, and stresses faced during the higher educational levels. This result coincides with the results of Jeddah's study [8]. Furthermore, participants with enough and exceeding family income in the current study had a lower prevalence of IBS compared to others, which agree with numerous other studies [8,10,19]. This finding may attributed to the "hygiene hypothesis" and its role in IBS [10].

Students lived with their family had a lower IBS prevalence compared to those living in dorms ($p > 0.05$). This result is in line with other studies [8, 10, 20]. Living away from family may affect students' lifestyle, decrease their ability to manage stresses, and becoming more prone to diseases as IBS [10].

The prevalence of IBS was higher among smokers compared to others, in the current study ($p > 0.05$). This agrees with results from Jeddah study. [8] This can be explained by direct effect of nicotine on gut, or smoking may be a marker for unfortunate psychological condition that can precipitate IBS [2].

Okami, et al. [17] reported absence of significant association between practicing physical exercise and IBS, which coincides with our results. Our paramedical students who had excessive weight (higher BMI) reported a higher prevalence of IBS compared to others ($p > 0.05$), which agrees with results from other studies [8,19].

In the current study, participants who had family history of IBS were more likely to have IBS, which coincides with other studies [8,10]. This finding agrees with the familial aggregation of IBS cases. Results of twin studies support the involvement of genetic risk factors in the aetiology and pathogenesis of IBS [23].

The enteric nervous system is very sensitive to emotional stresses. Negative emotions can cause alteration of intestinal motor function, and might cause IBS symptoms [18]. Similarly, our findings revealed that participants who faced stresses during the six months preceding the study were about two times more likely to have IBS compared to others. Students from the medical field usually face stressful life situations due to their extended times of intensive physical and mental function under high pressure [2]. Lee, et al. [24] reported also that stress was associated with IBS. A strong association was reported between mental strains and IBS among university students from Germany [25].

Our results revealed presence of associations between IBS and each of anxiety and depression. Depression is also one of IBS predictors. Naeem, et al. [12] reported also that medical students who were diagnosed with IBS from Karachi (Pakistan) obtained higher scores of both anxiety and depression. Similarly, results of a systematic review and meta-analysis included 10 case-control studies, 2014, illustrated that IBS patients had significantly higher levels of both anxiety and depression compared to controls. [26] These findings also agree with the results of many other studies [8, 12,17]. All these findings can be explained by "the bio-psychological model of IBS, which leads to disruption of the brain–gut pathways" [26].

Our research found that students with poor sleep quality (PSQI) were about twice times more likely to have IBS compared to others. Poor sleeping may be considered as a risky stressful influence that can disturb the normal biological rhythm, and hence changing the gut motility [2,19]. This finding coincides with the results from the previous two studies from Jeddah [8,19].

Participants who had chronic medical conditions in the present study were more prone to IBS, which agrees with the results of a systematic review between medical students [2].

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) [27]. This can be explained by disruption of gut microbiota due to infection [28].

Our study revealed that IBS prevalence was higher between students who had food

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

5. CONCLUSION

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

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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