

Prevalence of Irritable Bowel Syndrome and its Relation to Self-esteem, Depression, and Quality of Life of Female Students in Health-Related Faculties at Umm Al-Qura University

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Abstract: Irritable Bowel Syndrome (IBS) is a widespread disorder associated with stressful factors among university students. This study aim was to measure the prevalence of IBS among female students in health-related faculties, identify its potential risk factors, and assess associated psychological aspects such as symptoms of depression, self-esteem, and Quality of Life (QoL). This cross-sectional analytic study was conducted on 1351 female students enrolled in all medical faculties, faculty of nursing, pharmacy, applied medical science and faculty of medicine, dentist at Umm Al Qura University, Saudi Arabia. A self-administered questionnaire was used to collect data regarding IBS (developed by the World Gastroenterology Organization), self-esteem (*Rosenberg self-esteem scale*), and depression (*Center for Epidemiologic Studies Depression Scale*), the *IBS-QoL scale*, in addition to relevant socio-demographic and health data. Data were collected from December 2013 to May 2014. The prevalence of IBS was 33.7% (95% CI 31.33-36.07); 58.5% had depressive symptoms (95% CI 56.03-60.97); 9.3% had low self-esteem (95% CI 7.85-10.75), and 10.0% had low QoL (95% CI 8.50-11.50). From multivariate analysis, IBS was associated with use of laxatives (OR=4.14), stress (OR=2.14), and drinking tea (OR=1.43), while the intake of fibers was protective (OR=0.65). The presence of IBS was significant independent factor leading to worse QoL, while a higher school year and a higher self-esteem were associated with better QoL. The study concludes that the prevalence of IBS among university students in health-related faculties is high. Its independently associated factors are stress, use of laxatives, and low fiber intake. The disorder is associated with high prevalence of depressive symptoms and low QoL, in addition to low self-esteem. Screening programs for IBS and related psychological problems are recommended.

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1. Introduction

Irritable Bowel Syndrome (IBS) is one of the most common conditions encountered in clinical practice but one of the least well understood.^(1,2) It is a functional gastrointestinal (GI) disorder characterized by a group of symptoms that occur together, with no organic GI damage, i.e. not a disease. In the past, IBS was called colitis, mucous colitis, spastic colon, nervous colon, and spastic bowel. The name was changed to reflect the understanding that the disorder has both physical and mental causes and is not a product of a person's imagination.⁽³⁾

The symptoms of IBS usually first appear between 20 and 30 years of age, and is more common in women.⁽⁴⁾ They tend to come and go in bouts, often during times of stress or after eating certain foods, and vary in severity among individuals. Patients usually experience abdominal pain and altered bowel habits, with predominance of diarrhea (IBS-D), constipation (IBS-C), or both (IBS-M). Some may also have mucus in stools with painful stomach cramps with bowels

opening.⁽⁵⁾ Visceral hypersensitivity and its modification along with the central transmission are the characteristics of IBS patients.⁽⁶⁾ Nonetheless, the severity of symptoms appears to have a modest role in how IBS patients describe their health in general.⁽⁷⁾

There is no definitive investigation as no biomarker has been found, so IBS is diagnosed clinically through medical history questions focusing on bowel habits, diet, exercise, and stress.⁽⁸⁾ Physical examination looks for other possible causes of GI problems. Blood chemistries may be ordered to look for abnormalities such as an allergy to gluten, in addition to testing for blood in the stool. Endoscopy of the GI tract may include a colonoscopy and esophago-gastro-duodeno-scopy. Biopsies may be taken to exclude the possibility of cancer, celiac disease, or inflammatory bowel disease.⁽⁹⁾

There is a strong connection between the Central Nervous System (CNS) and the gut. The emotional problems linked to IBS are often related to issues of self-esteem, self-confidence and self-respect. They

may express themselves as anxiety, panic attacks, depression or eating disorders, or can result in the diarrhea/constipation seesaw of IBS.⁽¹⁰⁾ Self-esteem is often defined as an individual's self-perception of own abilities, skills, and overall qualities that guide and/or motivates specific cognitive processes and behaviors. Research suggests that self-esteem and chronic illness either have a direct or indirect effect on one another.⁽¹¹⁾

Patients with IBS seem to have higher levels of anxiety in relationships, and their lower self-esteem could influence the way they deal with the disease and how the communication with health care professionals works out.⁽¹²⁾ Moreover, a study demonstrated that IBS patients perceive stigma about their illness, with increased prevalence of depression and anxiety, decreased self-esteem and self-efficacy, and lower Quality of Life (QoL). Additionally, the perceived stigma was shown to have a negative impact on clinical outcomes.⁽¹³⁾ Such psychological disorders can affect the way patients perceive discomfort coming from the GI tract. Thus, understanding this condition can give patients the reassurance to live with it.⁽¹⁴⁾ However, although research showed a strong link between IBS and these psychological disorders, it is still unclear which one comes first. Since serotonin is involved in many of the functions of digestion and is also associated with depression symptoms, problems with the body's regulation of serotonin may be behind the overlap between IBS and depression.⁽¹⁵⁾

Furthermore, IBS is often associated with significant disability and health care costs. The disease burden extends to family members, and this increases proportionally with IBS severity.^(16,17) Consequently, these patients have significantly impaired QoL. A study of an IBS cohort showed that dysfunctional cognition independently influenced patients' physical and mental QoL and symptom severity, with more negative impact in the presence of anxiety and depression disorders.⁽¹⁸⁾ Moreover, the QoL of patients was found to be lower compared with patients with other GI diseases or other chronic diseases such as asthma and migraine.⁽¹⁹⁾

The treatment for IBS will depend on the types and severity of symptoms, and how they affect daily life. The first step involves watching and recording symptoms, bowel habits, eating, and other daily life activities that affect these symptoms. Instructions are given to patient accordingly in terms of limiting intake of caffeine, fatty foods, dairy products, and fruits if diarrhea is the main symptom; increasing fibers in case of constipation; avoiding beans, cabbage, or cauliflower in case of bloating or gases. Exercise can improve QoL. Taking prescribed medicines may be needed for cramps, diarrhea, constipation, depression, or anxiety.⁽²⁰⁻²³⁾ The management may also include

cognitive-behavioral therapies.^(24,25) A course of analytical hypnotherapy (hypno-analysis) would help to fully resolve all issues relating to IBS. It can also provide patient with a greater sense of self; it will boost self-confidence and self-esteem; it will help build self-belief. An added bonus is that hypnosis is wonderfully relaxing and reduces stress levels.⁽²⁶⁾ Although a study demonstrated that treatment with tiotropium is effective and safe for managing IBS symptoms, there is not enough evidence and further studies are required.⁽²⁷⁾

Significance of problem

Irritable bowel syndrome is widespread in all societies, generating substantial workload in primary and secondary health care. Students in medical, nursing, and other health-related faculties are particularly vulnerable to IBS being in a most challenging and stressful type of education. Added to this are other stressful factors such as living in school dormitory, morbid anxiety, and emotional stress. Moreover, IBS may interfere with their academic performance, working ability and social life, in addition to the economic burden of IBS management.

Aim of the study

This study is aimed at:

1. Measuring the prevalence of IBS among female students in health-related faculties;
2. Identifying the potential underlying risk factors;
3. Assessing the associated psychological aspects such as symptoms of depression, self-esteem, and QoL.

2. Subjects and Methods

Research design and setting: A cross-sectional analytic design was used in carrying out the study where the dependent and independent variables were assessed at the same point in time. The study was conducted at all medical faculties, faculty of nursing, pharmacy, applied medical science (Nutrition, laboratory medicine and health administration departments), and faculty of medicine, dentist at Umm Al-Qura University.

Participants:

Sample criteria: All students enrolled in the faculties of nursing, medicine, dentistry, pharmacy, applied medical sciences (Nutrition, laboratory medicine and health administration departments). The only inclusion criteria were being full-time female student, with no exclusion criteria. The total number of eligible students was 1850.

Sample size: The sample size was calculated to estimate an expected prevalence rate of IBS of 30% or higher, with an absolute precision of 1.5% and at 95% level of confidence. Using the sample size estimation for a single proportion and finite population correction

(Epi-Info 6.04 software program), the required sample size was 1284. This was increased to 1500 to compensate for an expected non-response rate of approximately 15%.

Sampling technique: A quota sampling technique was used in recruiting 1500 students from in the abovementioned settings. The sample was divided almost proportionately to the number of students in each faculty. It included 100 students from the faculty of nursing, 750 from the faculty of medicine, 100 from the faculty of dentist, 150 from the faculty of pharmacology, in addition to 150 from clinical nutrition, 100 from health administration, and 150 from Laboratory medicine departments.

Tools of data collection: The researchers prepared a self-administered questionnaire to collect data regarding IBS, self-esteem, and depression. It included the following parts.

Part I: Socio-demographic data: This was used to collect data about student's age at the time questionnaire, race/ethnicity, marital status, educational attainment, and occupation.

Part II: Health habits and medical history: This was adopted from *Abdulmajeed et al. (2011)*⁽²⁸⁾ and modified by the researchers. It included questions about food habits such as the number of regular meals per day, intake of fibers, fast food, and daily consumption of tea, coffee, soda, smoking, use of laxatives, etc. It also asked about the presence of hemorrhoids and the history of previous abdominal operations.

Part III: IBS questionnaire for HCP: This questionnaire was developed by the World Gastroenterology Organization with Dan one support.^(29,30) to diagnose suffering from IBS. The researchers adopted it and made some modifications. The questionnaire consists of 20 questions. The first three questions ask about the frequency of having discomfort or pain in the abdomen (scored 0 to 3), for duration of 6 months or longer (scored 0 to 2), and any relation to menstrual bleeding (scored 1). This is followed by 12 questions asking about the details of this pain or discomfort such as relation to bowel movement, stools consistency, etc. The responses to these questions were "all/most of the time: scored 2," "some of the time: scored 1," and "never: scored 0." The remaining five questions were asking about family history of IBS and other GI diseases, recent use of antibiotics, unintentional weight loss, blood in stools, and symptoms leading to wake up at night. These were Yes/No questions. The scores of the first 15 questions are summed up. A score of 25 or higher indicates that the student is likely to be suffering from IBS, whereas a score 15-24 implies that the student may suffer from IBS but other conditions are also possible.

Part IV: Center for Epidemiologic Studies Depression (CES-D) Scale: This scale was developed by *(Hann et al., 1999; Radloff et al., 2000; and Andy et al., 2012)*^(31,32,33) to measure symptoms of depression in the community. The scale has also been used in many studies as a screen for the presence of depressive illness. It is composed of 20 statements. Four of the statements are worded in a positive direction to control for response bias, and their scores are reversed. Respondents are asked how often each statement was felt during the past week, to be rated on a 4-point scale from "rarely or none of the time i.e. less than 1 day: scored 0" to "most or all of the time i.e. 5-7 days: scored 3." The total score ranges from 0 to 60, with higher scores indicating more severe depressive symptoms. A score of 16 or higher indicate depressive illness: mild (16-20), moderate (21-25), and severe (26+).

Part V: Rosenberg self-esteem scale (RSES): This 10-item scale measures global self-worth by measuring both positive and negative feelings about self through asking the respondents to reflect on their current feelings. Items are answered on a 4-point Likert scale ranging from "strongly agree" to "strongly disagree." Five items are positively worded such as "*I take a positive attitude toward myself*" and five negatively worded such as "*I certainly feel useless at times*".⁽³⁴⁾ The scoring of each positive item is from 0 to 3, and this is reversed for negative items so that the total score ranges from 0 to 30. Scores between 15 and 25 are within normal range; scores below 15 suggest low self-esteem.

Part VI: Irritable Bowel Syndrome-Quality of Life Measure (IBS-QOL): This is a self-report QoL measure specific to Irritable Bowel Syndrome (IBS) that can be used to assess the impact of IBS.^(35,36) It comprises 34 items with 5-point response scale (0 to 4) that covers eight dimensions of Health-Related Quality of Life (HRQL): dysphoria (8 items), interference with activity (7 items), body image (4 items), health worry (3 items), food avoidance (3 items), social reaction (4 items), sexual concerns (2 items) and relationships (3 items). The scores are summed up and converted into a percent score. Higher values indicate lower HRQL.

The researchers prepared the tool after thorough review of the literature. The scales were translated into Arabic using the translation back-translation method to ensure their validity.⁽³⁷⁾ Two health professionals did the forward translation independently and backward translation was done by two professional translators separately as well. In each translation step, sessions were conducted by translators and agastroenterologist (MHE) to evaluate the translations. The tool was then vigorously revised by experts to finalize them.

The reliability of the scales used in the tool was assessed in a pilot study applied on 5% of the total sample chosen by convenience from female students in medical faculties. The pilot also served to test the content applicability, clarity, and sequence of the items. From the finding of the pilot study some questions and item were omitted, added or rephrased and the final form was developed. These students were not included in the main study sample. The pilot testing showed high reliability of the scales with Cronbach alpha coefficients 0.747 for the depression scale, 0.977 for the QoL scale and 0.798 for the self-esteem scale.

Administrative and ethical consideration: Official permissions to conduct the study were obtained from the vice-deans of postgraduate and scientific research of all previously mentioned study settings after explaining aim of the study through the coordination of the vice-dean of postgraduate and scientific research at the faculty of nursing. The researchers met with the eligible students individually and/or in groups, explained to them the purpose of the study and invited them to participate. They were reassured about their right to refuse participation. The confidentiality and anonymity of any obtained information was secured. Professional help was provided to the students whose results indicated any possible disorders.

Fieldwork: The data collectors, trained by the researchers, handed the data collection forms to the students who gave their consent to participate. This was done during their free time in the faculty. The students were informed again about the purpose of the study, and got complete instructions regarding answering the questionnaire. The data collectors attended the answering of the questionnaire and ensured that all basic information was complete. Data were collected during the period from the beginning of December 2013 to the end of May 2014.

Statistical analysis: Data entry and statistical analysis were done using SPSS 18.0 statistical software package. Cronbach alpha coefficient was calculated to assess the reliability of the developed tools through their internal consistency. Categorical variables were compared using chi-square test. To identify the independent predictors of the risk of IBS, multiple logistic regression analysis was used. In order to identify the independent predictors of the scores of depression and QoL, multiple linear regression analysis was used after testing for normality, and homoscedasticity and analysis of variance for the full regression models were done. Statistical significance was considered at p -value <0.05 .

3. Results

The total validly completed forms obtained were 1351, giving a response rate of 88%. As illustrate in Table 1, 75.9% of the students were in the age 20-25 years. Only slightly more than one-tenth (11.0%) of them were married. Approximately two-thirds of the sample consisted of students from the 2nd, 3rd, and 4th years, while the lowest percentage was from 6th year students (9.6%).

Table 2 shows that the majority of the students (89.9%) was eating fast food, while only less than one-third of them reported eating 3 regular meals daily (31.2%). As regards their medical history, more than two-fifth (41.7%) reported having suffered previous psychological stress, 9.3% were having hemorrhoids, 7% were using laxatives, and 5.8% had previous abdominal surgery.

The prevalence of IBS among students in the study sample was 33.7% with 95% confidence interval (CI) 31.33-36.07 as shown in Table 3. Also, 58.5% had some degree of depressive symptoms with 95% CI 56.03-60.97. Moreover, most of these symptoms were severe (23.0%): As regards self-esteem, the table demonstrates a prevalence of 9.3% of low self-esteem, with 95% CI 7.85-10.75. Also, one-tenth of the students had low QoL (10.0%) with 95% CI 8.50-11.50.

Table 4 points to no statistically significant associations between IBS and any of the students' personal characteristics. Although the prevalence of IBS tends to be higher among married students compared with single ones, the difference did not reach the level of statistical significance ($p=0.09$). Meanwhile, the table indicates statistically significant relations between IBS and students' depressive symptoms ($p<0.001$) and self-esteem ($p=0.02$). It is evident that the prevalence of IBS is higher among the students who have moderate to severe depressive symptoms and those who have low self-esteem.

Figure 2 illustrates a statistically significant association between students' QoL and IBS ($p<0.001$). It shows that the great majority of students having no IBS have high QoL (89.9%). On the contrary, 67.4% of those having IBS have low QoL compared with only 32.6% of those having no IBS.

From multivariate analysis (Table 5), it is evident that the students having IBS have more than four-fold probability of using laxatives (OR=4.14), more than two-fold probability of having stress (OR=2.14), and almost one and a half folds probability of drinking tea (OR=1.43). On the other hand, the intake of fibers seems to be protective (OR=0.65). Other factors such as marital status and intake of 3 meals have no statistically significant independent influence on the occurrence of IBS.

Table 6 demonstrates that a higher self-esteem score is the most important statistically significant

factor independently and negatively influencing student's depression score while a higher QoL score (poorer QoL) is associated with a higher depression score. The presence of IBS is also an independent statistically significant factor positively influencing the depression score. The model explains 32% of the variation in depression score. Other variables as age, marital status, and school year have no statistically significant independent influence on the depression score.

Table 1: Socio-demographic and school characteristics of students in the study sample (n=1351)

	Frequency	Percent
Age:		
<20	325	24.1
20-25	1026	75.9
Marital status:		
Single	1203	89.0
Married	148	11.0
School year:		
1	195	14.4
2	298	22.1
3	272	20.1
4	288	21.3
5	168	12.4
6	130	9.6

Concerning student's QoL score, the table indicates that the presence of IBS is the most important statistically significant independent factor leading to higher QoL score (i.e. worse QoL), followed by the depression score as indicated by their standardized coefficients. On the contrary, a higher school year and a higher self-esteem score are associated with lower QoL scores, i.e. better QoL. The model explains 24% of the variations in QoL score. Other variables as age, marital status, and school year have no statistically significant independent influence on the QoL score.

Table 2: Food habits as reported by students in the study sample (n=1351)

	Frequency	Percent
Take 3 daily regular meals	422	31.2
Eat fiber-rich food	850	62.9
Eat fast food	1215	89.9
Drink tea daily	405	30.0
Drink coffee daily	530	39.2
Drink soda daily	216	16.0
Use laxatives	95	7.0
Had previous abdominal surgery	78	5.8
Suffered previous psychological stress	564	41.7
Has hemorrhoids	125	9.3

Table 3: Irritable Bowel Syndrome (IBS), depressive symptoms, self-esteem, and Quality of Life (QoL) among students in the study sample (n=1351)

	Frequency	Percent
Irritable bowel syndrome (Rome III):		
No	896	66.3
Yes	455	33.7
95% confidence interval for IBS	31.33-36.07	
Depressive symptoms (CES-D):		
No	560	41.5
Mild	201	14.9
Moderate	279	20.7
Severe	311	23.0
Total depression	791	58.5
95% confidence interval for total depression	56.03-60.97	
Self-esteem (Rosenberg):		
Low	126	9.3
High	1225	90.7
95% confidence interval for low self esteem	7.85-10.75	
Quality of Life (QoL):		
Low	135	10.0
Average	751	55.6
High	465	34.4
95% confidence interval for low QoL	8.50-11.50	

Table 4: Relation between Irritable Bowel Syndrome (IBS) and students' socio-demographic characteristics, depressive symptoms, and self-esteem

	Irritable Bowel Syndrome				X ² test	p-value
	No		Yes			
	No.	%	No.	%		
Faculty:					10.14	0.12
Nursing	52	54.2	44	45.8		
Medicine	494	67.3	240	32.7		
Dental	44	59.5	30	40.5		
Clinical nutrition	105	70.5	44	29.5		
Health administration	30	63.8	17	36.2		
Pharmacology	83	69.7	36	30.3		
Laboratory medicine	88	66.7	44	33.3		
Age:					0.11	0.74
<20	218	67.1	107	32.9		
20+	678	66.1	348	33.9		
Marital status:					2.85	0.09
Single	807	67.1	396	32.9		
Married	89	60.1	59	39.9		
School year:					3.79	0.58
1	129	66.2	66	33.8		
2	207	69.5	91	30.5		
3	183	67.3	89	32.7		
4	179	62.2	109	37.8		
5	113	67.3	55	32.7		
6	85	65.4	45	34.6		
Depressive symptoms:					47.16	<0.001*
No	426	76.1	134	23.9		
Mild	134	66.7	67	33.3		
Moderate	157	56.3	122	43.7		
Severe	179	57.6	132	42.4		
Self-esteem (Rosenberg):					5.24	0.02*
Low	72	57.1	54	42.9		
High	824	67.3	401	32.7		

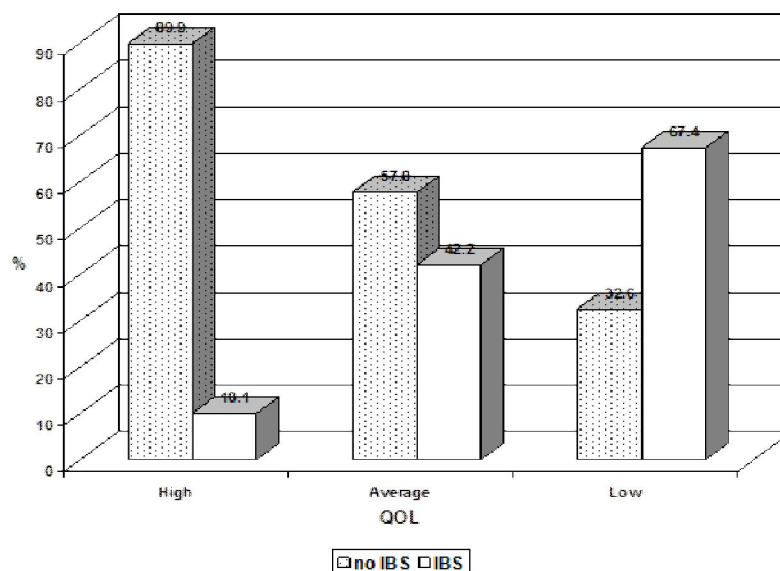
(*) Statistically significant at $p < 0.05$ 

Figure 1: Relation between Irritable Bowel Syndrome (IBS) and students' total QOL

Table 5: Best fitting multiple logistic regression model for the presence of IBS

	Wald	Df	P	OR	95.0% CI for OR	
					Upper	Lower
Constant	26.78	1.00	<0.001	0.29		
Married	2.74	1.00	0.098	1.36	0.95	1.97
Have 3 meals	3.12	1.00	0.077	0.79	0.60	1.03
Fibers intake	11.90	1.00	0.001	0.65	0.51	0.83
Tea	7.52	1.00	0.006	1.43	1.11	1.85
Laxatives	37.55	1.00	<0.001	4.14	2.63	6.53
Stress	39.52	1.00	<0.001	2.14	1.69	2.71
Nagelkerke R Square: 0.112						
Hosmer and Lemeshow Test: $p=0.892$						
Omnibus Tests of Model Coefficients: $p<0.001$						

Table 6: Best fitting multiple linear regression model for the depression and QoL scores

	Unstandardized Coefficients		Standardized Coefficients	t-test	<i>p</i> -value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Depression score							
Constant	31.73	1.13		28.21	<0.001	29.53	33.94
IBS	1.20	0.47	0.06	2.57	0.010	0.29	2.12
Self-esteem score	-0.84	0.04	-0.46	-19.67	<0.001	-0.93	-0.76
QOL score	0.15	0.02	0.21	8.28	<0.001	0.11	0.18
r-square=0.32; Model ANOVA: F=212.734, <i>p</i> <0.001 Variables entered and excluded: age, marital status, school, year							
QoL score							
Constant	26.92	2.12		12.70	<0.001	22.76	31.08
School year	-0.87	0.20	-0.10	-4.30	<0.001	-1.26	-0.47
IBS	8.95	0.66	0.33	13.55	<0.001	7.66	10.25
Self-esteem score	-0.24	0.07	-0.09	-3.32	0.001	-0.39	-0.10
Depression score	0.33	0.04	0.23	8.15	<0.001	0.25	0.40
r-square=0.24 Model ANOVA: F=107.22, <i>p</i> <0.001 Variables entered and excluded: age, marital status, school							

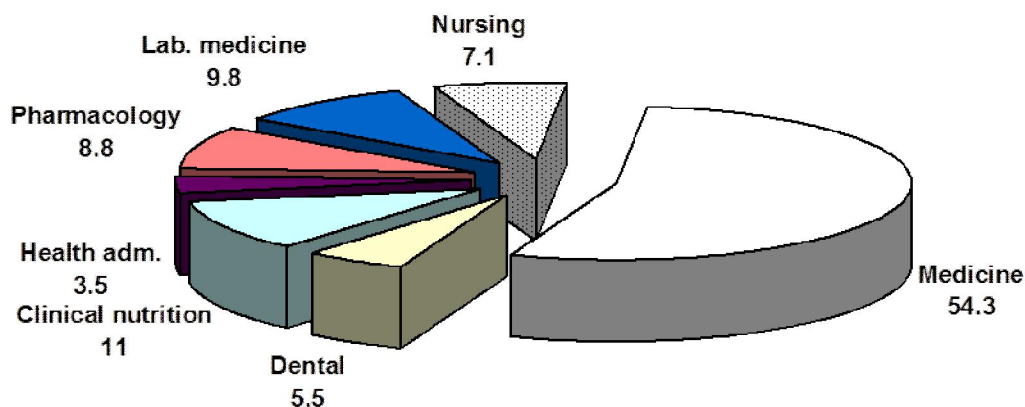


Figure 1: Distribution of students in the study sample according to faculties (n=1351)

4. Discussion

The study findings indicate a relatively high prevalence of IBS among female university students in health-related faculties, and this is associated with depression, low self-esteem and low QoL. The findings are based on a self-administered questionnaire with standardized scales. The response rate of 88% was generally high for a survey using self-administered tool. It is close to the rate reported in a similar study at king Saud University, Riyadh, Saudi Arabia where the response rate was 91.6%.⁽³⁸⁾

The present study identified a high prevalence rate of IBS among students, approximately one-third, with a high degree of precision as indicated by the narrow confidence interval. The rate is close to those reported in other studies in Saudi Arabia (31.8%).⁽³⁹⁾ Pakistan (28.3%).⁽⁴⁰⁾ and Korea (29.2%).⁽⁴¹⁾ This high prevalence might be attributed to the nature of the study in these health-related faculties, which poses high levels of stress on students. In line with this, studies have shown that the enormous stress of medical students life predisposes them to IBS.⁽⁴²⁾ The length of time it takes to complete medical studies, the numerous difficult exams, and the irregular working hours are examples of such stress.⁽⁴³⁾ Jimenez *et al.*, 2010 identified three stressors (clinical, academic, and external) linked to clinical nursing practice.⁽⁴⁴⁾ **Jahangiri *et al.*** conducted a systematic review in Iran, which showed that IBS was more prevalent in the first and second year compared to fourth and fifth year medical students.⁽⁴⁵⁾

According to the present study, the use of laxatives is the most important factor independently influencing the presence of IBS. However, given that the study design is cross-sectional, no temporal association between these two factors can be deduced. Thus, it is not possible to discern whether the use of laxatives preceded the occurrence of IBS (independent predictor), or followed its occurrence (dependent factor). A longitudinal design is necessary to disentangle this ambiguity. Nonetheless, the use of laxatives is a common practice in IBS patients, especially those with the predominantly constipation type.⁽⁴⁶⁾ Moreover, **Russo *et al* (2015)**⁽⁴⁷⁾ in a study in Italy considered the decreased use of laxatives as indicator of improvement of IBS, which implies that it is a dependent rather than an independent factor. On the other hand, and in agreement with our findings, the use of laxatives was found to be a significant predictor of IBS in a recent study in Australia.⁽⁴⁸⁾

Moreover, an important factor found to be positively and independently related to IBS in the current study is the exposure to stress. In multivariate analysis, it had more than two-fold probability among students having IBS. This is quite expected since

stress and anxiety have been always claimed to be important risk factors for IBS. In congruence with this, **Nozu and Okumura (2015)**⁽⁴⁹⁾ clarified that IBS is a stress-induced altered gut motility, and the corticotropin-releasing factor (CRF) mediates these gastrointestinal functional changes in colonic contractility and sensation. Also, recent studies have demonstrated the effectiveness of psycho-therapeutic interventions addressing patient's anxiety and stress in relieving the symptoms of IBS.^(50,51) Other major elements of the bio-psychosocial model such as personality traits and psychiatric disorders are probably the elements which make one susceptible to the development of IBS.⁽⁵²⁾

On the contrary, the present study findings indicate that the intake of fibers may be protective from IBS. This is in line with recent evidence of the beneficial effects of fiber-rich food on large bowel functions. The clinical efficacy of fibers depends on their solubility, degree/rate of fermentation, viscosity, and gel formation.⁽⁵³⁾ The mechanisms of action in the prevention and relief of constipation involve the gel-dependent water-holding capacity of the soluble fiber and the mechanical irritant action of the insoluble fiber. However, some of the marketed fiber supplements can cause gastrointestinal symptoms.⁽⁵⁴⁾

As the present study results demonstrated, more than half of the students were having depressive symptoms. Even if we consider only those having severe depressive symptoms, the rate is approximately one-fourth, which is quite high. This could be attributed to the highly stressful and sometimes frustrating nature of their study. Although the frequency of depressive symptoms was significantly higher with the presence of IBS in bivariate analysis, this association disappeared in multivariate analysis, where the statistical significance persisted between the scores of depressive symptoms and each of the scores of self-esteem and QoL. Thus, depression might not be directly related to IBS, but through the intermediate action of low self-esteem and low QoL. In agreement with this, a study in China demonstrated the lack of any statistically significant relation between IBS and depression among medical students.⁽⁵⁵⁾

Meanwhile, a significant association was revealed between students' QoL and their having IBS, and the multivariate model for the QoL score identified the presence of IBS as the most influential factor. Similar findings were revealed in a study in China where IBS was found to have deleterious effects on patients' QoL.⁽⁵⁶⁾ Actually, only approximately one-third of these students were having a high QoL, a situation that needs further study to identify the factors underlying such generally low level of QoL. A recent study of the QoL of medical students had similar

findings and reached to the same conclusion concerning the need for further research in this area.⁽⁵⁷⁾

The current study has also revealed that approximately one-tenth of the students were having low self-esteem, and this was significantly related to IBS in bivariate analysis, although it did not persist in multivariate analysis. A similar significant association between IBS and low self-esteem was revealed in a study in Sweden.⁽⁵⁸⁾ Moreover, a more recent study in Sweden confirmed this association between low self-esteem and IBS through multivariate analysis.⁽⁵⁹⁾

Meanwhile, the prevalence of low self-esteem in our sample is lower than that reported by *Aarif (2009)*⁽⁶⁰⁾ in a study on medical students in India, which reported that the prevalence of low self-esteem was 18%. The discrepancy with the present study could be attributed to the setting since the Indian study was carried out in a rural area, while our study was in the capital city.

The present study has also demonstrated that the scores of students' self-esteem were independently influencing their depressive symptoms and QoL scores. Thus, lower self-esteem is associated with more depressive symptoms and worse QoL. This implies that a feeling of low self-esteem is an intermediate factor in inducing depressive symptoms and low QoL among the students in our sample. In congruence with this, *Bonsaksen et al (2015)*⁽⁶¹⁾ in a study in Norway argued that in chronic disorders, the duration of illness and the ability to cope with the symptoms are important factors influencing the feeling of self-esteem. Thus, the annoying and sometimes embarrassing symptoms of IBS would be expected to negatively influence self-esteem, with consequent negative impacts on the prevalence of depressive symptoms and on QoL.

Conclusion and recommendations

The study findings lead to the conclusion that the prevalence of IBS among university students in health-related faculties is high. Its independently associated factors are stress, use of laxatives, and low fiber intake. The disorder is associated with high prevalence of depressive symptoms and low QoL, in addition to low self-esteem.

In the light of these findings, screening programs for IBS and psychological problems is recommended for these students. Stress management courses are required to enable students to cope with different stressors during their university studies and work. Also modifications of lifestyle regarding dietary habits are required.

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