The Prevalence of Irritable Bowel Syndrome (IBS) in a Private-University in Malaysia, and Its Associated Factors Including Stress, Depression and Anxiety

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Authors' contributions

This work was carried out in collaboration between both authors. Author IRSAS designed the study, performed the statistical analysis, wrote the protocol, wrote the Original Research in a Thesis and approved the final-version of this Article to be published. Author MAAM helped in the re-tabulation/re-analyses and the discussion of the data, revisiting the said Thesis critically for valuable intellectual content and final approval of the version to be published. Both authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Background to the Study: Information on the prevalence of Irritable bowel syndrome (IBS) in the Asian population is relatively scanty although it is prevalent in the general population. There have only been few Asian studies concerning anxiety, stress and depression in their association with IBS. IBS is a common gastrointestinal disorder, and its prevalence and demographics have been only been studied using different methodologies and with varying results.
Objectives: To determine the prevalence of IBS among nursing students at MAHSA University, Malaysia, and to determine whether anxiety, depression, stress is associated with IBS, besides determining the common sub-types.
Methods: This cross-sectional study was conducted from March to July 2017 at MAHSA University, Malaysia on nursing students from the Faculty of Nursing. All participants completed a self-administered Questionnaire.

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Results: The prevalence of IBS among nursing students according to Rome Ⅲ criteria was 46.8%. The commoner sub-type of IBS was IBS-Diarrhea (44, 46.8%) followed by IBS-Constipation (38, 40.4%) and IBS-Mixed (12, 12.8%). Students who stayed at the hostel had significant association with IBS-C ($p < 0.05$) compared to IBS-D and IBS-M. Depression and IBS were significantly associated ($p < 0.05$).

Conclusion: The prevalence of IBS among nursing students studying in MAHSA University, Malaysia is 46.3% which is conspicuously higher than in previous studies in other countries. IBS-D is the commonest sub-type of IBS (46%). In addition, IBS is significantly associated with depression, but anxiety and stress are not. There is no significant association between IBS and Socio-demographic factors, except in gender.

1. INTRODUCTION

Irritable Bowel Syndrome (IBS) is one of the most common functional bowel disorders, defined as the presence of abdominal pain or discomfort in association with altered bowel habits, without any organic damage to the intestine, [1] although abnormal gut motor and sensory functions have been implicated among the Asian IBS subjects. Recently, there is evidence of altered colonic neuro-immune function leading to gut hypersensitivity and dysmotility.

It is a commonly prevalent gastrointestinal disorder. The pathophysiology of IBS is still not completely understood, but psychological disorders may affect the onset and outcome of IBS in many patients [1].

O'Malley D (2018) states that pathophysiological changes linked to Irritable Bowel Syndrome (IBS) include stress and immune activation, changes in gastrointestinal microbial and bile acids profiles and sensitisation of extrinsic and intrinsic gut neurons [2].

O'Malley further states that the heterogeneity of IBS underscores a complex multifactorial pathophysiology, which involves dysfunction of the bidirectional signaling-axis between the brain and the gut. This axis incorporates efferent and afferent branches of the autonomic nervous system, circulating endocrine-hormones and immune factors, local paracrine and neurocrine factors and microbial metabolites [2].

Additionally states that, L-cells, which are electrically-excitable biosensors embedded in the gastrointestinal epithelium, secrete glucagon-like peptide-1 (GLP-1) in response to nutrients in the small intestine. But, these appear to function differently more distally in the gastrointestinal tract, where they are activated by luminal-factors including short-chain fatty-acids, bile-acids and microbial metabolic-products, all of which are altered in IBS patients. GLP-1 can also interact with the hypothalamic-pituitary-adrenal stress-axis and immune-system, both of which are activated in IBS. Given that a GLP-1-mimetic has been found to alleviate acute pain symptoms in IBS patients, GLP-1 may be important in the manifestation of IBS symptoms [2].

Rome III subtype classifies as follows: Subjects affected mainly by "loose bowels/diarrhea" are classified into IBS-D. Those mainly affected by "constipation" are classified as IBS-C, and those with both are considered to be IBS-M [1].

To diagnose IBS, patients must have recurrent abdominal pain or discomfort for at least three months in the previous six months, with two or more of the following symptoms: (1) relief with defecation, (2) onset associated with a change in frequency of stool, and (3) onset associated with a change in form (appearance) of stool [3].

In addition, the classification of IBS subtypes is based on the predominant stool pattern. IBS with constipation (IBS-C) has hard or lumpy stool in at least 25% of the time and loose (mushy) or watery stools in less than 25% of bowel movements. IBS with diarrhea (IBS-D) has loose (mushy) or watery stools at least in 25% of the time and hard stools in less than 25% of bowel movements. Mixed IBS (IBS-M) has hard or lumpy stool in at least 25% of bowel movements and loose (mushy) or watery stool in at least 25% of bowel movements. Un-subtyped IBS means insufficient abnormality of stool consistency to meet criteria of the other three subtypes [3].

It is one of the commonest disorders diagnosed by gastroenterologists and is a common cause of

general-practice visit. Although the disease is not life-threatening, patients appear badly affected in their everyday life [4]. Its prevalence and associated-factors have been ascertained using different methodologies with varying results [5]. Its prevalence varies in different communities [6,7].

Information on the prevalence of IBS in Asian-populations is relatively scanty [8]. There have been only a few Asian studies concerning anxiety and depression associated with irritable bowel syndrome (IBS) [9].

The impact of the psychological factors associated with IBS has been widely studied in Western countries [10]. Individuals may interpret one's health events in a manner that is partly dependent on their social and cultural backgrounds. However, there are only a few studies in Asia, and these studies have mainly focused on the prevalence, symptom patterns, or impact on the QOL of IBS patients [11].

Epidemiological studies of irritable bowel syndrome (IBS) among young adults are few, especially in Asian countries [12]. Functional gastrointestinal disorders, including functional dyspepsia, irritable bowel syndrome and functional constipation are very common worldwide [3]. Patients with IBS are more likely to suffer from anxiety leading to the burden of illness affecting the quality of life [13].

Some Asian IBS-studies have been published in recent decades since the evolution of the IBS-definition, and the understanding in the pathogenesis, diagnosis and treatment. These studies describe the current situation of IBS in many countries and show conspicuous cultural-differences within Asia, and in comparison with the West. Asian IBS subjects do experience psychological disturbances including anxiety, depression, agoraphobia and neuroticism. Accordingly, their quality of life is poor and there is absenteeism leading to excessive physician visits [14].

Changing-lifestyles and rapid changes in the socioeconomic-environment contribute to the increased prevalence of IBS in Asian countries. Recently, more attention has been given to the influence of psychosocial factors in the pathogenesis, severity, course, and outcome of IBS [15]. Gender differences, psychological symptoms, and response to psychological treatments have not been well-studied [16].

However, Chang FY and Lu CL [14] say Western recommended criteria clearly diagnose Asian IBS and many factors are mutual leading to IBS. Current IBS treatments remain useful.

IBS is common in the general population, but students may be at particularly special-risk because of psychological-distress due to examinations and study-load, and because they may be far from their families.

The Objective of our study was to determine the prevalence of Irritable Bowel Syndrome (IBS) among the Nursing-students diploma and bachelor) from the Faculty of Nursing at the MAHSA University in Malaysia. The Objective was also to determine the Sub-types, besides the association between socio-demographic factors, such as gender, age, living conditions (with a family, in a private house or in hostel), ethnicity, and Irritable Bowel Syndrome – and also, its association with stress, anxiety and depression.

2. METHODS

Our study was of a Cross-sectional Design. To our knowledge, this is the first study using Rome Ⅲ criteria to determine the prevalence and the associated factors of Irritable Bowel Syndrome among nursing students in Malaysia. The period of our study was from March to July 2017. The Questionnaire was first pre-tested on a sample of 20 students.

No Sampling was done, and our study was conducted by the census-method at the start of the students' classes.

To calculate sample size, the prevalence of IBS in the study-population was estimated from previous studies which showed values of prevalence rate, p= 17.4%, (1 – p) q= 82.6% and 'degree of precision' = 5%. Using acceptable significance-level (p-value) as 0.05 at 95% CI and Zα= 1.96, a Sample-size of 220 was arrived at, although only 203 Nursing-students participated in the study.

All participants completed a Self-administered Questionnaire after providing Informed-consent. The Questionnaire was first pre-tested on a sample of 20 students. A standardised self-administered Questionnaire, which has been developed by the Rome Foundation Board to

identify Functional Gastrointestinal Disorders (FGIDs) was used. In this, IBS is defined as recurrent abdominal pain or discomfort at least three days/month in the last three months associated with two or more of the following:

1. Improvement with defecation
2. Onset associated with a change in frequency of stool
3. Onset associated with a change in form (appearance) of stool

The criteria above needed to be fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis [17].

The third part was the Depression Anxiety and Stress Scales - 21 (DASS 21). The English-version of the DASS-21 was used. The English-version of the DASS-21 has been validated by many studies. One of them is by Nieuwenhuijsen K et al. [18].

The DASS is a set of 3 scales designed to assess distress along the dimensions of depression, anxiety and stress.

The 21-item version has three sub-scales with 7 items each concerning Anxiety (Items 2, 4, 7, 9, 15, 19, 20), Depression (Items 3, 5, 10, 13, 16, 17, 21) and Stress (Items 1, 6, 8, 11, 12, 14, 18). The scale-point ranged between 0 (Does not apply to me at all) and 3 (Applies to me very much or most of the time). The respondents indicate the frequency or extent to which they experienced each of the symptoms described on the Items. The scores for each scale were obtained by summing the responses and multiplying by two.

Table 1. Classification of severity of depression, anxiety and stress according to DASS-21 scores

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

The study was approved by the Ethics Committee of the Faculty of Medicine, MAHSA University, Malaysia.

Data-management and data-analysis (both Descriptive and Analytical) was done using IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.

Hypothesis testing for all variables was conducted using the Chi-squared test to determine the presence of association between each variable of socio-demographic characteristic and Irritable Bowel Syndrome. Binary logistic regression was performed to determine the association between anxiety, stress, and depression with IBS.

Level of significance acceptable was set at $p < 0.05$.

Only 'Age' as a variable was quantified as a Numerical Scale which was subsequently transformed into Categorical Ordinal. Thus, the 'Mean' and the 'Standard Deviation (SD)' is not denoted here for any of the Variables.

There are a number of limitations to our study.

First, the age-range is limited – thus, comparison of IBS-prevalence among the different age groups is limited.

Secondly, our study uses a self-administered questionnaire – and thus, sensitive questions especially to adolescents, were avoided.

Thirdly, our data is based on a selected-group of nursing-students and may not be generalisable to all nursing-students. No Random Sampling was done.

Fourthly, the extra-stress on students when having their exam may have exaggerated their gastrointestinal symptoms and psychological stressors, thus affecting our results.

Fifth, the Total Number of subjects was slightly less than the sample-size calculated.

Sixth, the subjects' Past Medical History, Social History, and Dietary History was not obtained. Such would have made our study more complete. This is particularly made prominent in a requirement because the study by Ng QX et al in 2018, showed that inflammatory bowel disease (IBD) in remission could also produce IBS-like symptoms [19].

Lastly, males in our study comprised only 11.8%.

3. RESULTS

Prevalence of Irritable Bowel Syndrome and association with Socio-demographic Factors: The prevalence of IBS among nursing students according to Rome Ⅲ criteria was 46.3% (95% CI: 39.6% to 53.2%). (Table 3). The prevalence of IBS among female students was more than in male students, 85 (47.5 %) and 9 (9.6%)) respectively. There was a significant association between gender and IBS ($\chi 2$ = 10.24) (p < 0.01).

Table 2. Prevalence of irritable bowel syndrome among nursing students

Frequency	%	95% CL	
		Lower	Upper
94	46.3%	39.58%	53.17%

The Socio-demographic factors in relation to prevalence of IBS is summarised here in Table 3.

Most of participants who have IBS were from the age group of 17-20 years i.e. 74 (78.7%). Seventeen participants (18.1%) were from the age-group of 21-24 years and three participants (3.2%) were aged ≥ 25. There was no significant association between age and IBS ($\chi 2$ = 2.07) (p > 0.30). Similarly, Ethnic group and Living-condition.

Comfort after Completing a Bowel-movement, Change of Frequency of Stool (whether more frequent), Change of Frequency of Stool (whether less frequent), and Whether Enough Sleep in relation to presence of IBS are tabulated in Table 4.

Students who stayed at the Hostel were found to have a significant association with IBS-C 35 (39.3%, p < 0.05). Malay students were found to have IBS-C more commonly i.e. 23 (41.8%), followed by IBS-D, 22 (40.0%), and followed by IBS-M, 10 (18.2%). Fourteen (56.0%) of Other Race students were found to have IBS-D, 9 (36.0%) had IBS-C and 2 (8.0%) had IBS-M.

Students in the age-group 17-20 years were mostly affected with IBS-D 36 (48.6%), whereas IBS-C numbered 28 (37.8%) and IBS-M, 10 (13.5%).

Table 3. Relationship between demographic characteristics and IBS

	Total n (%)	IBS		χ^2	P-value
Gender					
Male	24 (11.8%)	9	9.6%	10.24	<0.01
Female	179 (88.2%)	85	47.5%		
Age					
17-20	167 (82.3%)	74	78.7%		
21-24	29 (14.3%)	17	18.1%		
≥ 25	7 (3.4%)	3	3.2%	2.111	>0.30
Ethnicity					
Malay	110 (54.2%)	55	58.5%		
Indian	13 (6.4%)	5	5.3%		
Chinese	20 (9.9%)	9	9.6%		
Other	60 (29.6%)	25	28.6%	1.459	>0.69
Living Condition					
Hostel	189 (93.1%)	89	94.7%		
With family	4 (2.0%)	2	2.1%		
Private house	10 (4.9%)	3	3.2%	1.202	> 0.61

Table 4. Symptoms in association with presence of IBS

Symptoms	Total	IBS	No IBS	P value
In the last 3 months (abdominal pain or discomfort)				
Feeling more comfortable after completing a bowel movement	105	79 (75.2%)	26 (24.8%)	<0.001
Change in the frequency of stool (more frequently)	55	42 (76.4%)	13 (23.6%)	<0.001
Change in the frequency of stool (less frequently)	45	35 (77.8%)	10 (22.2%)	<0.001
Symptoms wake from sleep	52	34 (65.4%)	18 (34.6%)	<0.0015

In female-students, IBS-D was found the commonest i.e. 39 (45.9%), while IBS-M was much lower at 11 (12.9%). There was no significant association between gender and IBS-D, IBS-C, IBS-M (p > 0.30).

Relationship between Socio-demographic characteristics and anxiety, stress and depression: The relationship between Socio-demographic characteristics and anxiety, stress and depression is summarised in Tables 5–6.

Psychological factors in relation to the Irritable Bowel Syndrome: The relationship

between anxiety, stress and depression, each separately with IBS, is summarised in Tables 7 – 9.

Binary logistic regression was used to determine the relationship between anxiety, stress and depression with Irritable Bowel Syndrome. Anxiety and stress were not significantly associated with IBS (p value > 0.09, > 0.38 respectively). In contrast, there was significant association between depression and IBS (p < 0.05), indicating that depression could be a predictor of IBS and that psychological factors play a role in the development of IBS. Table 6.

Table 5. Relationship between Socio-demographic characteristics and anxiety

Characteristics	Anxiety				
	Normal	Mild	Moderate	Severe	Extremely severe
Gender					
Male	11 (45.8%)	2 (8.3%)	7 (29.2%)	3 (12.5%)	1 (4.2%)
Female	72 (40.2%)	26 (14.5%)	52 (29.6%)	15 (8.4%)	13 (7.3%)
Age					
17 - 20	66 (39.5%)	24 (14.4%)	51 (30.5%)	14 (8.4%)	12 (7.2%)
21 - 24	14 (48.3%)	3 (10.3%)	7 (24.1%)	3 (10.3%)	2 (6.9%)
➢ 25	3(42.9%)	1 (14.3%)	2 (28.6%)	1 (14.3%)	0 (0%)
Ethnicity					
Malay	43 (39.1%)	16 (14.5%)	34 (30.9%)	9 (8.25%)	8 (7.3%)
Indian	5 (38.5%)	1 (7.7%)	5 (38.5%)	0 (0%)	2 (15.4%)
Chinese	8 (40.0%)	6 (30.0%)	3 (15.0%)	3 (15.0%)	0 (0%)
Others	27 (45.0%)	5 (8.3%)	18 (30.0%)	6 (10.0%)	4 (6.7%
Living Conditions					
Hostel	77 (40.7%)	28 (14.8%)	56 (29.6%)	17 (9.0%)	11 (5.8%)
With family	1 (25.0%)	0	2 (50.0%)	0	1 (25.0%)
Private homes	5 (50.0%)	0	2 (20.0%)	1 (10.0%)	2 (20.0%)

Table 6. Relationship between socio-demographic characteristics and depression

	Depression				
	Normal	Mild	Moderate	Severe	Extremely severe
Gender					
Male	15 (62.5%)	3 (12.5%)	5 (20.8%)	1 (4.2%)	0 (0%)
Female	121 (67.6%)	26 (14.5%)	26 (14.5%)	5 (2.8%)	1 (0.6%)
Age					
17 – 2-0	14 (68.3%)	23 (13.8%)	24 (14.4%)	5 (3.0%)	1 (0.6%)
21 - 24	17 (58.6%)	5 (17.2%)	6 (20.7%)	1 (3.4%)	0 (0%)
≥ 25	5 (71.4%)	1 (14.3%)	1 (14.3%)	0 (0%)	0 (0%)
Ethnicity					
Malay	74 (67.3%)	15 (13.6%)	17 (15.5%)	3 (2.7%)	1 (0.9%)
Indian	7 (53.8%)	4 (30.8%)	1 (7.7%)	1 (7.7%)	0 (0%)
Chinese	15 (75%)	3 (15.0%)	2 (10.0%)	0 (0%)	0 (0%)
(Other)	40 (66.7%)	7 (11.7%)	11 (18.3%)	2 (3.3%)	0 (0%)
living condition					
Hostel	129 (68.3%)	28 (14.8%)	27 (14.3%)	4 (2.1%)	1 (0.5%)
With families	2 (50.0%)	1 (25.0%)	1 (25.0%)	0 (0%)	0 (0%)
Private homes	5 (50.0%)	0 (0%)	3 (30%)	2 (20%)	0 (0%)

Table 7. Psychological factors in relation to the irritable bowel syndrome: Anxiety

	Anxiety					X^2	p
	Normal	**Mild**	**Moderate**	**Severe**	**Extremely severe**		
Gender							
Male	11(45.8%)	2 (8.3%)	7 (29.2%)	3 (12.5%)	1 (4.2%)	1.339	0.80
Female	72 (40.2%)	26(14.5%)	53(29.6%	15 (8.4%)	13 (7.3%)		
Age							
17 - 20	66 (39.5%)	24 (14.4%)	51 (30.5%)	14 (8.4%)	12 (7.2%)	2.360	0.90
21 - 24	14 (48.3%)	3 (10.3%)	7 (24.1%)	3 (10.3%)	2 (6.9%)		
≥ 25	2 (42.9%)	1 (14.3%)	2 (28.6%)	1 (14.3%)	0 (0%)		
Ethnicity							
Malay	43 (39.1%)	16 (14.5%)	34 (30.9%)	9 (8.2%)	8 (7.3%)	11.44	0.40
Indian	5 (38.5%)	1 (7.7%)	5 (38.5%)	0 (0%)	2 (15.4%)		
Chinese	8 (40.0%)	6 (30.0%)	3 (15%)	3 (15%)	0 (0%)		
(Other)	27 (45%)	5 (8.3%)	18 (30%)	6 (10.0%)	4 (6.7%)		
Living condition							
Hostel	77 (40.7%)	28 (14.8%)	56 (29.6%)	17 (9.0%)	11 (5.8%)	7.866	0.30
With family	1 (25.0%)	0 (0%)	2 (50.0%)	0 (0%)	1 (25.0%)		
Private homes	5 (50.0%)	0 (0%)	2 (20.0%)	1 (10.0%)	2 (20.0%)		

Footnote: 1. Ethnicity is a Categorical Nominal variable
2. Living Condition is a Categorical Nominal variable
3. Age is a Categorical Ordinal variable
4. Gender is a Categorical Nominal variable

Table 8. Psychological factors in relation to the irritable bowel syndrome: Stress

	Stress					X^2	p
	Normal	**Mild**	**Moderate**	**Severe**	**Extremely severe**		
Gender							
Male	18 (75.0%)	3 (12.5%)	1(4.2%)	2(8.3%)	0(0%)	6.655	0.06
Female	153 (85.5%)	18 (10.1%)	7 (3.9%)	1(0.6%)	0(0%)		
Age							
17 - 20	144 (86.2%)	16 (9.6%)	5 (3.0%)	2 (1.2%)	0(0%)	7.704	0.20
21 - 24	21 (72.4%)	4 (13.8%)	3 (10.3%)	1 (3.4%)	0 (0%)		
≥ 25	6 (85.7%)	1 (14.3%)	0 (0%)	0 (%)	0 (0%)		
Ethnicity							
Malay	92 (83.6%)	12 (10.9%)	4 (3.6%)	2 (1.8%)	0 (0%)	8.665	0.30
Indian	9 (69.2%)	1 (7.7%)	2 (15.4%)	1 (7.7%)	0 (0%)		
Chinese	19 (95.0%)	1 (5.0%)	0 (0.0%)	0 (0%)	0 (0%)		
(Others)	51 (85.0%)	7 (11.7%)	2 (3.3%)	0 (0%)	0 (0%)		
Living condition							
Hostel	163 (86.2%)	19 (10.1%)	6 (3.2%)	1 (0.5%)	0 (0%)	22.24	*0.01*
With family	2 (50.0%)	2 (50.0%)	0 (0%)	0 (0%)	0 (0%)		
Private homes	6 (60.0%	0 (0%)	2 (20.0%)	2 (20.0%)	0 (0%)		

Footnote: 1. Ethnicity is a Categorical Nominal variable
2. Living Condition is a Categorical Nominal variable
3. Age is a Categorical Ordinal variable
4. Gender is a Categorical Nominal variable

4. DISCUSSION

To our knowledge, this is the first study using Rome Ⅲ criteria to determine the prevalence and the associated factors of Irritable Bowel Syndrome among nursing students in Malaysia. The prevalence rate of IBS was found to be 46.3% among the nursing students studying at MAHSA University, Malaysia.

Table 9. Psychological factors in relation to the irritable bowel syndrome (Depression)

	Depression					X^2	p
	Normal	**Mild**	**Moderate**	**Severe**	**Extremely severe**		
Gender							
Male	15 (62.5%)	3 (12.5%)	5(20.8%)	1(4.2%)	0(0%)	2.078	0.70
Female	121 (67.6%)	26 (14.5%)	26 (14.5%)	5 (2.8%)	1(0.6%)		
Age							
17 - 20	114 (68.3%)	23 (13.8%)	24 (14.4%)	5 (3.0%)	1(0.6%)	4.582	0.90
21 - 24	17 (58.6%)	5 (17.2%)	6 (20.7%)	1 (3.4%)	0 (0%)		
≥ 25	5 (71.4%)	1 (14.3%)	1 (14,3%)	0 (%)	0 (0%)		
Ethnicity							
Malay	74 (67.3%)	15 (13.8%)	17 (15.5%)	3 (2.7%)	1 (0.9%)	8.538	0.80
Indian	7 (53.8%)	4 (30.8%)	1 (7.7%)	1 (7.7%)	0 (0%)		
Chinese	15 (75.0%)	3 (15.0%)	2 (10.0%)	0 (0%)	0 (0%)		
(Others)	40 (66.7%)	7 (11.7%)	11 (18.3%)	2 (3.3%)	0 (0%)		
Living condition							
Hostel	129 (68.3%)	28 (14.8%)	27 (14.3%)	4 (2.1%)	1 (0.5%)	15.097	0.06
With family	2 (50.0%)	1 (25.0%)	1 (25.0%)	0 (0%)	0 (0%)		
Private homes	5 (50.0%	0 (0%)	3 (30.0%)	2 (20.0%)	0 (0%)		

Footnote: 1. Ethnicity is a Categorical Nominal variable
2. Living Condition is a Categorical Nominal variable
3. Age is a Categorical Ordinal variable
4. Gender is a Categorical Nominal variable

Table 10. The relationship between anxiety, depression, stress and IBS by binary logistic regression

Variable	B	Odds ratio	95% CI		p
			Lower	**Upper**	
Anxiety	0.099	1.104	0.966	1.260	0.10
Stress	0.057	1.058	0.917	1.222	0.40
Depression	-0.152	0.859	0.745	0.992	*0.03*

Footnote: 1. Age is a Categorical Ordinal variable
2. Gender is a Categorical Nominal variable
3. Presence of Anxiety is a Categorical Nominal variable
4. Presence of Stress is a Categorical Nominal variable
5. Presence of Depression is a Categorical Nominal variable

This value is higher than that reported in China among medical and nursing students i.e. 32.1% according to Rome II criteria [20]. It is also higher than that reported in Egypt (22.9%) among medical and non-medical students using Rome Ⅲ criteria and the questionnaire was administered to Suez Canal University students [21]. The studies that were conducted in Saudi Arabia showed that the prevalence was 31.8% to 32.5% and the two studies used Rome Ⅲ criteria [22], while the prevalence of IBS among University students in Lebanon according to Rome Ⅲ criteria was 20% [23]. In Pakistan, a prevalence of 28.3% has been reported among medical students and the study used Rome Ⅲ criteria [24].

In addition, our finding is higher than that those reported in two Chinese studies which were conducted among nursing and university students of China. The prevalence of IBS according to Rome Ⅲ criteria was reported as 7.85% in the year 2010 [25], as compared to the prevalence of 17.4% in the year 2014 [15].

Prevalence was 12.6% among medical students of Gilan, Northern Province of Iran [6]. Internet survey in Japan reported that the prevalence of IBS according to Rome Ⅲ criteria was 13.1% [1]. The Saudi Arabian study among medical students reported that the prevalence of IBS was 21% [7]. A school-based study in China in the year 2014 reported that the prevalence of Irritable Bowel Syndrome according to Rome Ⅲ criteria was 22.9% [15]. In Nigeria, it was reported that the prevalence among students was 26.1% [26]. These prevalences are lower than that found in our study.

The differences in the prevalences above between this study and other previous studies outside Malaysia could be due to Geographical differences, and the differences in the Socio-demographic Factors.

Our study showed a significant gender difference in the prevalence of IBS. Female gender has long been believed to be a factor leading to IBS. In a meta-analysis, Kang indicated that eight of 14 Western-studies and four of eight Eastern studies have been female pre-dominant. In addition, Gwee stated that there was no female predominance except in a Japanese study. In contrast, an inter-national cooperation study does not show a female predominance in Japan. Many Chinese-studies appear to show a female predominance in ethnic Chinese IBS subjects. However, after correction for gender ratio in the control population, the female predominance existed only in one study [14].

In contrast, multiracial Malaysian and Singaporean studies show a female predominance although the gender factor of the Chinese population is not addressed. Interestingly, two earlier Singaporean studies did not obtain this trend for female-gender, while recent Rome I and II analyses reported similar gender trends. An Indian prevalence study also provides no distinct gender difference. It is believed that female gender is not a main risk factor for IBS in Asia [14].

In our study, the total number of participants having IBS was 94, and these were characterised by diarrhea (44), constipation (38) and mixed (12). These findings are quite similar to that reported by Lee [27]. One study in China reported that the IBS of the Diarrhea-type is more frequent than the IBS Constipation-type [25]. The Results of our study are also consistent with findings of a study conducted among Japanese University students which showed that the Constipation-type was more prevalent (47.8%) [12]. However, the findings of our study are not in agreement with the results shown by Naeem et al. [24] where the most common type was the Mixed-type followed by the Constipation-type.

We wish to note though here that in a prospective, multi-centre study in 2004, Mearin F et al showed that "IBS symptoms are instable over time and varies in intensity. Many patients with D-IBS or C-IBS move to A-IBS; but, shift from D-IBS to C-IBS, or vice versa, is very infrequent." [28].

The study in Saudi Arabia showed that IBS was Relieved by Defecation among 37.9% of the study-subjects while our study showed that students who have IBS felt more Comfortable after Defecation than the students who do not have IBS.

Regarding sleep, the study in Saudi Arabia showed that the students who sleep less than 8 h/day had a slightly higher prevalence of IBS compared to others [29].

Poor sleep was independently associated with IBS among adolescents in Shanghai, China [30]. Similarly, our study shows that Not Enough Sleep was found significantly higher in students who had IBS (56.4%) than those did not have IBS (34.6%) (p < 0.0015).

In our study, depression among nursing students was proved to be a major association with Irritable Bowel Syndrome. Our study is in agreement with the study by Dong et al. [3] which showed that depression was associated with IBS. On the other hand, our finding shows that anxiety is not associated with IBS, whereas the study by Dong et al. showed that it was [3].

The nursing students in our study experienced more Psychological-stress due to Examinations and Study-load. They had Lack of Concentration in different tasks. These individuals had a difficulty in managing their anger and at work or university activities.

The differences between our study and others may somewhat be due to characteristics of the study-subjects, differences in sampling method, methodological differences in assessment of psychological factors, and/or cultural differences in perception of somatic-symptoms of psychological problems.

Chan Y et al. [31] in a study aimed to model the moment-to-moment relationship between daily life stress, negative emotions and bowel symptoms among patients with irritable bowel syndrome – diarrhoea subtype (IBS-D) in the flow of daily life showed that patients with IBS-D reported more severe bowel symptoms than healthy-controls (HCs), but levels of daily life stress and negative affect were comparable between the groups. Time-lagged analysis of data revealed that, among patients with IBS-D, daily life stress predicted a decrease in abdominal pain and urgency to defecation at a subsequent time point, whereas severity of bowel symptoms and presence of diarrhoea predicted a subsequent increase in negative affect and daily

life stress. The above associations were not found among HCs.

In a Systematic-review with meta-analysis in 2018, Ng QX et al showed that random-effects meta-analysis found post-traumatic stress disorder (PTSD) to be a significant risk factor for IBS (pooled odds ratio 2.80, 95% confidence interval: 2.06 to 3.54, P < 0.001) among US Army veterans from eight primary-studies. They said their study provides "insights into the probable (patho) physiology and management of IBS, supporting a holistic consideration of the psychosocial aspects of IBS and further research into effective multi-modal therapeutics." [32].

Dietary factors (which can be dramatically different in the Western world) could also influence the prevalence of IBS-like symptoms, including through non-digestible carbohydrates (prebiotics) that are present in the foods we eat [33].

Besides polyphenols (most polyphenols have little bioavailability and reach the colon almost unaltered) exert potential effects on the gut microbiota which may then affect IBS [34].

Dietary polyphenols represent a wide variety of compounds that occur in fruits, vegetables, wine, tea, extra virgin olive oil, chocolate and other cocoa products. They are mostly derivatives and/or isomers of flavones, isoflavones, flavonols, catechins and phenolic acids, and possess diverse biological properties such as antioxidant, anti-ageing, anti-carcinogen, anti-inflammation, anti-atherosclerosis, cardiovascular protection, improvement of the endothelial function, as well as inhibition of angiogenesis and cell proliferation activity. Most of these biological actions have been attributed to their intrinsic reducing capabilities. They may also offer indirect protection by activating endogenous defense systems and by modulating cellular signaling processes [35].

Ng XQ et al. [33] found in random-effects meta-analysis based on three studies and 326 patients, a phyto-chemical (curcumin) to have a beneficial albeit not statistically significant effect on IBS symptoms (pooled standardised mean difference from baseline IBS severity rating -0.466, 95% CI: -1.113 to 0.182, p = 0.158). This was the first meta-analysis to examine the use of the phyto-chemical in IBS. With its unique anti-oxidant and anti-inflammatory activities and ability to modulate gut microbiota, it is a potentially useful addition to agents for IBS. More

robust clinical trials involving a standardised-preparation and larger sample sizes should be encouraged [33].

5. CONCLUSIONS AND RECOMMENDA-TIONS

Overall, PTSD is associated with an increased likelihood of IBS. This is the first meta-analysis to specifically examine the association between PTSD and IBS, and it provides insights into the probable (patho) physiology and management of IBS, supporting a holistic consideration of the psychosocial aspects of IBS and further research into effective multi-modal therapeutics.

The prevalence of IBS among nursing students studying in MAHSA University, Malaysia, is 46.3% which is conspicuously higher than previous studies in other countries. IBS-D is the commonest sub-type of IBS (46%). In addition, IBS is significantly associated with depression, but anxiety and stress are not. There is no significant association between IBS and Socio-demographic factors. Students who stay in the hostel were significantly associated with IBS-D and IBS-C. This study shows that proportionately more female students suffer from IBS than male students. It is recommended that more studies on Objective Measurement of Dietary Factors and Habits besides Exercise are needed to add to the understanding of the Scope and Dimensions of IBS in the population. Malaysian Universities should provide psychological-support by means of adequate counselling-services aimed at improving the socio-cultural-economic and psychological status of nursing-students, and other students in general. Nursing-students, and students in general, should also receive Health Education on IBS, as part of general Health Promotion among them. As Lu CL and Chang FY (2006) said, continued-education in this for medical professionals may be necessary in this matter.

CONSENT

All participants completed a Self-administered Questionnaire after providing Informed-consent.

ETHICAL APPROVAL

The study was approved by the Ethics Committee of the Faculty of Medicine, MAHSA University, Malaysia.

Fulfilment of his MSc Public Health degree at the MAHSA University, Malaysia. He wishes to thank God, his family and all people and institutions involved in making this research a success. In particular he would like to thank Prof. Dr. U Than Winn and his thesis-supervisor Associate Prof. Dr. CSP Senan.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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