



Psychosocial Factors Associated With Irritable Bowel Syndrome Development in Chinese College Freshmen

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Background/Aims

The role of psychosocial factors on irritable bowel syndrome (IBS) in adolescents is incompletely understood. The aim of this study is to investigate the association between the psychosocial factors and the risk of developing IBS in college freshmen.

Methods

A cross-sectional survey was conducted in a randomly selected freshmen population in Wuhan China (n = 2449). Questionnaire evaluated demographics and psychosocial risks. The population was divided into 3 groups: non-discomfort, chronic abdominal discomfort and IBS. The association between the development of IBS and psychosocial factors was analyzed by ordinal and multiple logistic regression analysis.

Results

A total of 2053 (83.8%) completed this survey (mean age, 18.2 ± 0.9 years; female, 35.6%). Among them, 82 (4.0%) fulfilled the Rome III criteria for IBS. Female (odds ratio [OR], 3.31; 95% confidence interval [CI], 2.47-4.45), experience of abuse (OR, 2.44; 95% CI, 1.10-5.56), and suicidal intention (OR, 2.17; 95% CI, 1.15-4.17) were more likely to have IBS. Compared with chronic abdominal discomfort, however, depression (OR, 5.55; 95% CI, 1.36-22.71) was the only dependent risk factor for IBS.

Conclusion

The prevalence of IBS in college freshmen is 4.0%, and to the freshmen, psychosocial factors such as experience of abuse, depression, and suicidal intention were associated with high risk of developing IBS.

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Key Words

Child abuse; Depression; Irritable bowel syndrome; Suicide

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Introduction

Irritable bowel syndrome (IBS) is a common functional gastrointestinal disorder (FGID) in the general population, which cause a heavy social burden.¹⁻⁶ Morbidity of IBS is diverse according to age, sex, occupation, and so on. Globally, the prevalence of IBS among college and university students was reported to range from 7.4% to 29.5%,⁷⁻¹⁰ much higher than those among children and adolescence (range from 1.2% to 5.6%).¹¹⁻¹⁶ In addition, previous researches showed that symptoms of IBS often appear in early adulthood.¹⁷ Therefore, the threshold of adulthood could be a progressive period for IBS.

The variety of the IBS incidence in early lifetime might be affected by a gradual development process of IBS. Chronic or recurrent abdominal pain is common in school-aged children and adolescents, and the prevalence was reported to range from 7% to 45%.¹⁸⁻²⁰ The chronic abdominal discomfort was suggested by previous studies to be an early-stage of IBS.^{21,22} In a birth cohort, Stuart Howell et al²³ found childhood abdominal pain could progress to adult IBS and was not the result from psychiatric comorbidity or emotional distress in adulthood. However, it has still not been clarified which factors mediated the precession from normality via chronic abdominal pain to IBS in early lifetime.

Psychosocial disorders before adulthood might serve as such factors. In adolescents, a previous article reported that psychosocial stress was significantly associated with reports of IBS-like symptoms in cases with recurrent abdominal pain.²² Meanwhile, in a study evaluating the association between pediatric functional abdominal pain and FGIDs in adulthood, pediatric depression was identified as the predictor of FGID (including IBS) later in life.²⁴ These results implied that abdominal discomfort could develop into adult IBS not in all children, but only those with some certain psychosocial disorders.

Therefore, in this cross-sectional study, we attempt to clarify the prevalence of IBS among Chinese college freshmen and search for potential psychosocial factors associated with high risk of developing IBS in this special period.

Materials and Methods

Participants

All participants in our study were recruited from the freshmen who were about to enroll in the Huazhong University of Science

and Technology in Wuhan City. Random cluster sampling method was applied for participant selection. Informed consents were obtained from both the students and university prior to our survey. In August 2017, the included freshmen received the questionnaires in a classroom, and completed the questionnaires voluntarily and anonymously with assistance of special trained doctors. Of the available 2449 recruited freshmen, 2053 students completed the questionnaire (83.8% response rate). Meanwhile, a detailed inquiry into previous medical records was applied for those freshmen suspected of suffering with IBS to exclude organic disease. Suspected or confirmed patients with organic disease were advised to consult physicians. The research protocol was approved by The Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology (IORG No. IORG0003571).

Questionnaires

Demographic information was evaluated such as age, sex (male or female), height, weight, body mass index (BMI), residence (city, town or rural area), education (science & engineering, liberal arts or medicine), and family type (only-child or multi-child, single-parent or two-parent). Then, screening questions was applied to identify IBS patients, such as (1) Did you suffer pain or other discomfort in your abdomen in the last 3 months?; (2) What is the frequency and duration of this pain or discomfort?; (3) Did your stool character abnormally change when you had this pain or discomfort?; and (4) Did your stools frequency abnormally change when you had this pain or discomfort? Freshmen with a positive answer to the first question were further interviewed regarding abdominal symptoms and characters. Information included general characters (ie, age, sex, and BMI), abdominal feelings (pain, bloating or other discomfort) and psychosocial characteristics such as anxiety, depression, suicidal intention and experience of abuse (emotional, physical or sexual) was collected. The questions and options were based on the Rome III diagnostic criteria. Since it has been reported that chronic abdominal discomfort in children is a precursor of IBS in adulthood,²³⁻²⁵ this study considered the freshmen with abdominal discomfort of more than 3 months as an unique group with a high risk of developing IBS. Accordingly, the included cases were divided into 3 groups: IBS group (cases met Rome III IBS diagnostic criteria), chronic abdominal discomfort group (cases with abdominal discomforts, more than 3 months but not fit for Rome III IBS diagnosis), and others. Also, the data of psychosocial factors was collected by questionnaires, including depression, anxiety, suicidal intention, and abuse history according to the Rome III Psychosocial Alarm Questionnaire for the FGIDs.

Statistical Methods

Our study expanded previous investigations by stratified analyses of IBS development. Differences in general characteristics according to IBS development among 3 groups were evaluated by ANOVA or the chi-square test. Then, confounders such as sex, age, BMI, major, living area, family, anxiety, depression, experience of abuse, and suicidal intention were adjusted to exclude their intertwined influence on IBS development.

The odds ratios (ORs) of IBS development were calculated by the ordinal logistic regression analysis model with adjusting for sex, age, BMI, major, residual area, and family structure. Multiple

logistic regression analysis was also performed, adjusting for mentioned risk factors. SPSS version 17.0 (IBM Corp, Armonk, NY, USA) was applied for statistical analysis. The mean ± SD was evaluated for quantitative variables, while frequencies were applied for qualitative variables. Two-tailed analyses were conducted, and *P*-value < 0.05 were considered statistically significant in this study.

Results

Subject Characteristics

The overall questionnaire response rate was 83.8%. The mean

Table 1. General Characteristics of Participants According to Irritable Bowel Syndrome Development

Characteristics	Non-discomfort group	Abdominal discomfort group	IBS group	<i>P</i> -value
Sex				< 0.001
Females	574 (32.0)	108 (61.4)	49 (59.8)	
Males	1221 (68.0)	68 (38.6)	33 (40.2)	
Age (yr)	18.2 ± 0.9	18.1 ± 0.8	18.1 ± 0.6	0.913
BMI (kg/m ²)	21.0 ± 3.2	20.7 ± 2.9	21.0 ± 2.8	0.052
Education				0.012
Engineering	1175 (65.5)	103 (58.5)	42 (51.2)	
Liberal arts	125 (7.0)	17 (9.7)	12 (14.6)	
Medicine	495 (27.5)	56 (31.8)	28 (34.1)	
Residence				0.655
City	827 (46.1)	84 (47.7)	43 (52.4)	
Rural area	567 (31.6)	58 (33.0)	21 (25.6)	
Town	401 (22.3)	34 (19.3)	18 (22.0)	
Only child				0.594
Yes	1060 (59.1)	103 (58.5)	53 (64.6)	
No	735 (40.9)	73 (41.5)	29 (35.4)	
Single parent				0.235
No	1695 (94.4)	161 (91.5)	76 (92.7)	
Yes	100 (5.6)	15 (8.5)	6 (7.3)	
Anxiety				0.007
No	1752 (97.6)	171 (97.2)	75 (91.5)	
Yes	43 (2.4)	5 (2.8)	7 (8.5)	
Depression				< 0.001
No	1727 (96.2)	172 (97.7)	69 (84.1)	
Yes	68 (3.8)	4 (2.3)	13 (15.9)	
Experience of abuse				0.001
No	1767 (98.4)	174 (98.9)	75 (91.5)	
Yes	28 (1.6)	2 (1.1)	7 (8.5)	
Suicidal intention				0.001
No	1747 (97.3)	169 (96.0)	75 (91.5)	
Yes	48 (2.7)	7 (4.0)	7 (8.5)	

IBS, irritable bowel syndrome; BMI, body mass index. Values were expressed as n (%) or mean ± standard deviation.

Table 2. Ordinal Logistic Regression Analysis With Risk Factors for Irritable Bowel Syndrome Development

Characteristics	Estimate	SE	WALS	P-value	OR (95% CI)
Sex					
Females	1.2	0.2	63.8	< 0.001	3.31 (2.47-4.45)
Males					1
Age (yr)	-0.0	0.1	0.1	0.750	0.98 (0.87-1.14)
BMI (kg/m ²)	0.0	0.0	0.0	0.945	1.01 (0.96-1.05)
Education					
Engineering	-0.0	0.1	0.0	0.948	0.99 (0.73-1.34)
Liberal arts	0.1	0.2	0.4	0.540	1.15 (0.72-1.86)
Medicine					1
Residence					
City	0.1	0.2	0.3	0.569	1.11 (0.78-1.58)
Rural area	0.2	0.2	1.0	0.301	1.24 (0.83-1.86)
Town					1
Only child					
Yes					1
No	-0.1	0.2	0.3	0.606	0.92 (0.67-1.26)
Single parent					
No					1
Yes	0.3	0.2	1.7	0.197	1.39 (0.84-2.32)
Anxiety					
No					1
Yes	0.2	0.4	0.3	0.599	0.81(0.59-1.23)
Depression					
No					1
Yes	0.2	0.3	0.5	0.482	1.26 (0.64-2.56)
Experience of abuse					
No					1
Yes	0.9	0.4	4.7	0.029	2.44 (1.10-5.56)
Suicidal intention					
No					1
Yes	0.8	0.3	5.7	0.017	2.17 (1.15-4.17)

SE, standard error; WALS, weighted-average least squares; OR, odds ratio; CI, confidence interval; BMI, body mass index.

age of these students was 18.2 ± 0.9 years, and 731 (35.6%) students were female. The mean height, weight, and BMI were 169.5 ± 7.9 cm, 60.7 ± 11.6 kg, and 21.0 ± 3.1 kg/m², respectively. Nine-hundred fifty-four (46.4%) students came from urban areas, 453 (22.1%) from suburban areas, while others from rural areas. In total, 121 (5.9%) students came from a single-parent family, with the remaining from double-parent households. Also, 1216 (59.3%) freshmen were the only child, while 837 (40.7%) had siblings. The demographic or clinical symptoms of the recruited freshmen are displayed in the Supplementary Table.

Prevalence of Irritable Bowel Syndrome

Of the 2053 college freshmen included in this study, 82 (4.0%)

were diagnosed with IBS based on the Rome III criteria, and 176 (8.6%) suffered with chronic abdominal discomfort. More females (49 [59.8%]) than males (33 [40.2%]) were diagnosed as with IBS. The IBS was more common in freshmen with anxiety ($P = 0.007$), depression ($P < 0.001$) and experience of abuse ($P = 0.001$), major of liberal arts ($P = 0.012$), and suicidal intention ($P = 0.001$), than those without (Table 1).

Exploratory Analysis for Correlation Between Psychosocial Factors and Irritable Bowel Syndrome Development

Among students with IBS ($n = 82$), chronic abdominal discomfort ($n = 176$) and others ($n = 1795$), ordinal logistic regres-

Table 3. Multivariate Logistic Regression Analyses for Risk Factors of Irritable Bowel Syndrome

Characteristics	β	SE	WALS	P-value	OR (95% CI)
Sex					
Females					1
Males	0.1	0.3	0.1	0.748	1.11 (0.57-2.15)
Age (yr)	-0.0	0.2	0.1	0.774	0.94 (0.64-1.39)
BMI (kg/m ²)	0.0	0.0	0.6	0.454	1.04 (0.94-1.15)
Education					
Engineering					1
Liberal arts	0.6	0.5	1.5	0.216	1.79 (0.71-4.52)
Medicine	0.2	0.3	0.4	0.522	1.23 (0.65-2.35)
Residence					
City					1
Rural area	-0.5	0.4	1.4	0.244	0.62 (0.28-1.38)
Town	-0.0	0.4	0.0	0.896	0.95 (0.44-2.03)
Only child					
Yes					1
No	-0.0	0.4	0.0	0.940	0.97 (0.48-1.97)
Single parent					
No					1
Yes	-0.3	0.6	0.4	0.531	0.70 (0.23-2.11)
Anxiety					
No					1
Yes	0.0	0.8	0.0	0.989	1.01 (0.21-4.78)
Depression					
No					1
Yes	1.7	0.8	5.7	0.017	5.55 (1.36-22.71)
Experience of abuse					
No					1
Yes	1.4	0.9	2.6	0.109	4.22 (0.72-24.50)
Suicidal intention					
No					1
Yes	0.7	0.6	1.5	0.226	2.05 (0.64-6.52)

SE, standard error; WALS, weighted-average least squares; OR, odds ratio; CI, confidence interval; BMI, body mass index.

sion analysis showed that female (OR, 3.31; 95% CI, 2.47-4.45; $P < 0.001$), experience of abuse (OR, 2.44; 95% CI, 1.10-5.56; $P = 0.029$), and suicidal intention (OR, 2.17; 95% CI, 1.15-4.17; $P = 0.017$) were independent risk factors to IBS development (Table 2).

In addition, multivariable logistic regression showed that depression was significantly associated with IBS risk compared with the chronic abdominal discomfort group (OR, 5.55; 95% CI, 1.36-22.71; $P = 0.017$) after being adjusted for other factors (Table 3).

Discussion

Our results showed that the prevalence of IBS in college freshman was 4.0%. Interestingly, it is different from our previous study

which reported the prevalence was 15.7% in the same university.⁹ Although the newer Rome III diagnostic criteria were applied for the current study, this 4.0% IBS prevalence in this study rate is comparable to the 1.2-5.6%¹¹⁻¹⁶ estimated for children and adolescence populations, which utilized the original Rome III criteria, but not to the 8.3-29.5% reported for university students.^{7,10,26} Besides, the prevalence of IBS in Chinese freshmen was also lower than that reported from the Asian Rome III survey of adults.²⁷⁻²⁹ Our results implied that the prevalence of IBS might increase after entering university, and early adulthood might be an IBS susceptible period at least for the well-educated population.

Factors which might affect the increasing prevalence of IBS in freshmen were assessed, and the psychosocial factors were found to

contribute to IBS development in college freshmen. Firstly, abuse experience in freshmen, including physical, sexual, and emotional abuse, was associated with increased vulnerability toward IBS. In a previous population-based survey conducted by Talley et al,²⁵ the high risk of IBS was significantly associated with abuse in childhood (OR, 2.02; 95% CI, 1.29-3.15), but not adulthood (OR, 1.39; 95% CI, 0.88-2.19). In addition, another research also showed IBS sufferers experienced more abuse compared with non-IBS populations, and abuse were associated with reports of greater gastrointestinal symptoms; however, the authors contributed such relationship to the concomitant mood disturbances.³⁰ Consistent with previous studies,³¹ our results showed experience of abuse before adulthood was associated with the development of IBS. But based on these results, psychological distress might not independently contribute to the development of IBS, at least not to the whole span of the development. So, experience of abuse before adulthood could have an independent association with IBS development.

Psychological factors such as depression are common among the children and adults with functional abdominal discomfort and/or IBS.³²⁻³⁴ However, it remains unclear whether depression before adulthood could be a significant marker for IBS into early adulthood. Our results showed that on the threshold of adulthood, more severe depression was observed in freshmen with IBS than those with only chronic abdominal discomfort. Similar to our report, in a prospective study of pediatric functional abdominal pain, after controlling for sex, age, follow up duration, baseline severity of abdominal pain, and so on, depression in childhood still significantly predicts FGID (including IBS) in young adulthood.²⁴ Considering the dramatic increase of prevalence in early adulthood, it could be greatly beneficial for the freshmen with chronic abdominal discomfort to receive psychotherapy or antidepressants if necessary to prevent progression of IBS. Besides, current results demonstrated development of IBS could increase the risk for suicidal intention, and this association existed independently of co-morbid depression. This finding, consistent with the analysis of Miller et al³⁵ in IBS patients, implied freshmen with IBS should be explicitly evaluated for possible suicidal behavior and timely interventions should be offered if any suicidal intention be detected.

To our knowledge, this is the first study of IBS prevalence and risk factors among Chinese university freshmen population. Results of this study should be interpreted in light of study limitations. Firstly, the items of questionnaire were limited and some detailed exclusion criteria (eg, other FGID) were not fully assessed. Therefore, the prevalence of IBS had a potential to be overestimated. Also, since our data are cross-sectional, we do not intend to suggest

that the results showed the direction of the association of psychosocial factors with IBS. In fact, it remains possible that the factors such as suicidal intention, experience of abuse and depression might increase under influence of IBS. So, at best, this data provides a possible causal relationship which could be confirmed through longitudinal analyses.

In summary, the present study found that the prevalence of IBS in university freshmen was low and similar to that reported for children and adolescence populations by our former researches. There was a significant association between the risk of developing IBS and experience of abuse and suicidal intention. In addition, depression might be connect with high risk of developing IBS in freshmen with chronic abdominal discomfort. An important clinical implication is that early adulthood in university could be a critical period for IBS development, and psychosocial factors such as experience of abuse, suicidal intention, and depression was related with risk of developing IBS.

Supplementary Material

Note: To access the supplementary table mentioned in this article, visit the online version of *Journal of Neurogastroenterology and Motility* at <http://www.jnmjournal.org/>, and at <https://doi.org/10.5056/jnm18028>.

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Conflicts of interest: None.

Author contributions: Tao Bai, Xiaohua Hou, and Chen Jiang conceived and designed the study; Tao Bai, Chen Jiang, and Yan Xu performed the data analysis; Chen Jiang and Tao Bai wrote the paper; and Stuti Sharma, Lei Zhang, Huan Wang, Jun Song, Wei Qian, and Xiaohua Hou reviewed and edited the manuscript. All authors read and approved the manuscript.

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