General

Prevalence and Associated Risk Factors of Irritable Bowel Syndrome Among Female Secondary School students in Ar Rass City, Qassim Region

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Keywords: adolescents, Irritable Bowel Syndrome, Rome IV criteria, secondary school, Saudi Arabia, survey

https://doi.org/10.52965/001c.35482

Health Psychology Research

Vol. 10, Issue 2, 2022

Background

Irritable bowel syndrome (IBS) is a common chronic gastrointestinal condition associated with many modifiable and non-modifiable risk factors.

Objectives

To determine the prevalence of IBS and the associated risk factors among female secondary school students in Ar Rass city, Qassim region, Saudi Arabia.

Methods

A cross-sectional study was conducted from June to August 2021 among female students attending government secondary schools at Ar Rass city, Qassim region. Two schools were selected by simple random sampling. A self-administered questionnaire using Google Form, submitted to the WhatsApp groups of the students, gathered personal data, and behavioral, lifestyle and health background characteristics of the participants. The questionnaire included Rome IV criteria for IBS diagnosis.

Results

Out of 612 invited students, 429 responded (response rate: 70.1%). Twenty-eight incomplete questionnaires were excluded leading to 401 participants in the final analysis. The mean (± SD) age of study participants was 17.3 (±2.05) years. The overall prevalence of IBS was 21.4% (n=86); 11.7% (n=47) were already diagnosed; however, 9.7% (n=39) were newly detected in our survey. The factors associated with IBS included frequent consumption of soft drinks (p=0.016), low vegetable consumption (p=0.003), poor mental health (p<0.0001), family history of IBS (p<0.0001) and history of chronic disease (p<0.0001).

Conclusion

IBS is prevalent among female secondary school students in Ar Rass city. Unhealthy diet and poor mental health are associated with IBS. Creating awareness regarding IBS and about importance of healthy lifestyle is recommended. School staff need to be trained to promote the physical and mental health of the students.

INTRODUCTION

Irritable bowel syndrome (IBS) is considered one of the most common chronic gastrointestinal disorder, which is characterized by frequent abdominal pain associated with change in the stool appearance or stool frequency.[1,2] Globally, about 10-20% of adults are affected with IBS, with in-

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creased incidence among females and those younger than 50 years of age.[3]

To date the pathogenesis of IBS is not well determined. However, some mechanisms may explain the pathophysiology of the disorder, including defect in serotonin regulation, post infectious IBS, and overgrowth of bacteria.[3,4] Psychosocial disorders such as depression and anxiety are found to be risk factors for IBS.[3–6]

The importance of diagnosing IBS lies in the prevention of wasting resources and improving patients' quality of life. So far, IBS has been a costly medical condition, consuming a lot of unnecessary investigations and medications.[7] It is also exhausting for the healthcare providers because of the frequent primary healthcare visits and repeated referrals to gastroenterologist.[1,7,8] There is no definite investigation for the diagnosis of IBS, and the diagnosis can be established by using the Rome IV Criteria, which depends on a group of symptoms for certain duration of time for the diagnosis of IBS.[6,7,9] Unfortunately, there are a lot of people who suffer from IBS and remain undiagnosed; only around 30% of those suffering from IBS reach out for medical care.[8]

Secondary school level is considered a very stressful and sensitive period of age since the adolescent students are heading for college and have to define their choices for the future. A meta-analysis conducted to estimate the prevalence of IBS among children and adolescents included 16 cross-sectional studies from China, Korea, Japan, Iran, Sri Lanka, and Saudi Arabia. The meta-analysis computed a pooled prevalence of 12.41%, and the reported IBS prevalence in the included studies ranged from 2.8% to 25.7%. The meta-analysis reported female gender as the main risk factor for IBS.[10] A study, including undergraduate students from all over Saudi Arabia, used Rome IV criteria for diagnosing IBS. The study reported prevalence of IBS as 15.8% and the observed risk factors were female gender, family history of IBS and emotional stress.[3] Another study conducted among male secondary school students in Najran, Saudi Arabia reported a high prevalence (39.8%) of IBS.[8]

There is a limited literature available on IBS among adolescents globally as well as locally in Saudi Arabia. As IBS has negative impact on student's life and their academic performance, it is important to explore the magnitude of IBS and the possible risk factors associated with it. Knowing the burden of IBS and its risk factors among adolescent population will help in designing appropriate interventions to address this important health issue, leading to improvement in general health and academic performance of the adolescent population.

In the above context, this study was conducted to determine the prevalence of Irritable Bowel Syndrome (IBS) and the associated risk factors among female secondary school students in Ar Rass city, Qassim region, Saudi Arabia.

METHODS

A cross sectional study was conducted from June to August 2021 among female high school students attending government secondary schools at Ar Rass city in Qassim region, Saudi Arabia. Out of 24 secondary schools in Ar Rass city, two government secondary schools were selected by simple random sampling method. The sample size was calculated by using OpenEpi sample size calculator.[11] According to the official statistics of Ministry of Education, total number of female secondary students in ARrass city were 3,458 students.[12] At 95% confidence interval with 5% bound on error and expected prevalence of 39.8%,[8] the required sample size was 333 female secondary school students. To account for non-response and data collection errors, the sample size was increased to 350 students.

A self-administered, semi-structured questionnaire was designed by adapting from previous studies.[4,13] Rome IV criteria was used for IBS diagnosis.[9] The questionnaire consisted of three sections. First section gathered information about socio-demographic characteristics such as age, marital status and income while the second section collected data regarding behavioral, lifestyle and health background characteristics of the participants. The third section included Rome IV criteria. The validated IBS module for adults was used which consists of five questions. Question one in the module is about the abdominal pain frequency for the last three months while the next three questions are about the association of abdominal pain with the change in bowel habits, stool form and stool frequency. The fifth question is about the onset of the abdominal pain. We followed the scoring algorithm for Rome IV questionnaire for diagnosing IBS.[9]

Electronic questionnaire was created by using Google form. A self-administered Arabic questionnaire with informed consent was provided electronically to all the participants. We contacted two teachers from each school by sending them a message via WhatsApp and requested for their cooperation. The survey link was distributed through students' institutional WhatsApp groups. Two reminders were sent for completion of required sample size.

Data form Google forms were downloaded to Microsoft Excel. After coding the data, it was imported to SPSS version 21 for analysis. Descriptive statistics were calculated as frequencies and percentages for categorical variables, and mean and standard deviation for numerical variables. Relevant inferential statistical tests were used for determining statistical associations. The results with p–value $\leqslant 0.05$ were considered statistically significant.

Ethical Considerations: Ethical approval of the study was taken from Qassim Research Ethics Committee (registration no. H-04-Q-001). The Education Administration in Ar Rass was contacted and permission for data collection was obtained. Permission was taken from the Rome Foundation for using Rome IV criteria. The study was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was taken from all participants after explaining them that their information will be kept anonymous and will be used for the scientific purpose only. The participation was voluntary, and the participants were informed that they could withdraw from the survey at any time.

RESULTS

The survey was sent to a total of 612 secondary school students. Out of these, 429 students completed the questionnaire, resulting in a response rate of 70.1%. Twenty-eight

Table 1. Sociodemographic characteristics of the study population

Personal characteristics	Number	Percentage
Age groups (in years) (n=394)		
13-18 years	312	79.2
19-25 years	82	20.8
Marital status (n= 400)		
Single	395	98.8
Married	5	1.2
Parents status (n= 401)		
Living together	346	86.3
Divorced	22	5.5
Dead (one of them or both	33	8.2
Monthly household income (n=401)		
<5000 Saudi Riyal	54	13.5
5000-10000 Saudi Riyal	134	33.4
>10000 Saudi Riyal	213	53.1
Family members (n=401)		
<5 members	54	13.5
5-10 members	316	78.8
>10 members	31	7.7
Participants' order in the family (n=401)		
First	111	27.7
Middle	215	53.6
Last	68	17
Only	7	1.7

questionnaires were excluded due to incomplete data. Thus, 401 questionnaires were included in the final analysis.

The mean (± SD) age of study participants was 17.3 (±2.05) years. Majority of the students (79.2%) ranged in age from 13 to 18 years. Most of the participants (98.8%) were single. The vast majority of the participants' parents (86.3%) were living together, 5.5% were divorced while for 8.2% students either one or both parents had died (Table 1).

A total of 86 students had IBS resulting in overall prevalence of 21.45%. Out of the total 401 students, 47 (11.7%) were already diagnosed; however, 39 (9.7%) were detected as IBS by Rome IV criteria in our survey (Figure 1).

Table 2 displays the behavioral and lifestyle characteristics of the study population. Majority of the participants (68.8%) perceived their weight as 'normal'. A total of 160 (39.9%) participants did not exercise at all during the last 7 days, while 43.4% had exercised for 1-3 days. The main source of food for most of the participants (90.8%) was their home. Regarding the breakfast, 21.9% of the participants reported that they skipped the breakfast during the last 7 days.

Regarding health background of the study participants, a significant number of the participants (44%) answered that 'sometimes' they were in a 'poor mental health status' (stress, anxiety, and/or depression) during the past one month, while around one-quarter (24%) were in poor mental health status 'most of the time'. More than a half of the participants (51.1%) had a positive family history of IBS. History of chronic disease was reported by 61 (15.2%) participants. A total of 39 (9.7%) participants were already diagnosed with IBS (Table 3).

On exploring association of demographic factors with IBS, it was noted that the prevalence of IBS was statistically significantly higher (p=0.006) in the age group 13-18 years as compared to the age group 19-25 years. The association of behavioral and lifestyle characteristics with IBS was explored separately for those who were already diagnosed with IBS and for those who were found to have IBS by screening in our survey. Among those who were already diagnosed with IBS, weight perception (p=0.325), physical activity (p=0.872) and number of sleeping hours (p=0.104) were not statistically significantly associated with IBS; however, frequency of intake of soft drinks showed statistically significant association with IBS (p=0.016).

Among the study participants who were found to have IBS by screening in our survey, there was a statistically significant association with weight perception (p=0.019) of the participants; higher proportion of participants perceiving themselves as underweight or overweight had IBS as compared to those who considered themselves as having normal weight. Frequency of vegetable consumption (p=0.003) and soft drinks consumption (p=0.049) also had statistically significant association with IBS.

Table 4 displays the association of IBS with health background characteristics of the study participants. There was statistically significant association between the prevalence of IBS and poor mental health (p<0.0001). Family history of IBS (p<0.0001) and history of chronic disease (p<0.0001) also had a statistically significant association with IBS.

The association of mental health with various variables was also explored. Mental health of the participants was found to be significantly associated with household income (p=0.006), number of sleeping hours (p=0.028), weight perception (p=0.004), and chronic diseases (p=0.014).

DISCUSSION

The irritable bowel syndrome (IBS) is considered a bothersome condition, since it has a negative impact on different aspects of a person's life. Globally, about 10-20% of adults

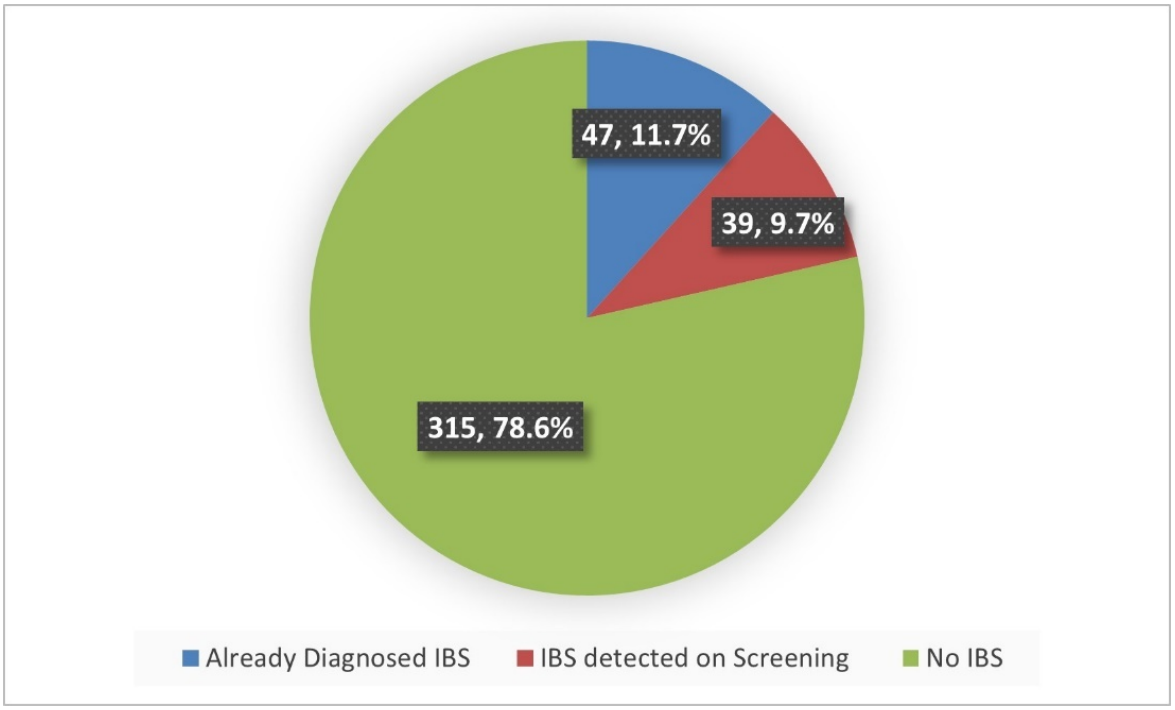

Figure 1. Prevalence of Irritable Bowel Syndrome (IBS) among female secondary school students in Ar Rass city according to the time of IBS diagnosis

Table 3. Health background characteristics of the study population (n=401)

Health background characteristics	Number	Percentage
Food allergy (n=401)		
No	219	54.6
Yes	75	18.7
I don't know	107	26.7
Family history of IBS (n=401)		
No	143	35.7
Yes	205	51.1
I don't know	53	13.2
History of chronic disease (n=401)		
No	340	84.8
Yes	61	15.2
Already diagnosed with IBS (n=401)		
No	362	90.3
Yes	39	9.7

are affected with IBS.[3] In Asia, the prevalence of IBS is reported to be higher among the younger age groups.[14] In a meta-analysis conducted by Priya *et al.,* 57 studies were reviewed with 92 different adult study populations, including 423,362 subjects. In studies using the Rome III criteria IBS pooled prevalence was 9.2% (95% CI 7.6% to 10.8%), compared with 3.8% (95% CI 3.1% to 4.5%) with those using Rome IV criteria.[2] The prevalence of IBS was higher with Rome III criteria in comparison to Rome IV criteria suggesting that Rome IV criteria is more stringent.[2]

Our study of female secondary school students in Ar Rass city showed that the overall prevalence of IBS was 21.4% which falls in the range reported for adolescents in Asia.[10] A higher prevalence was found in two similar studies carried out locally. In northern borders region, Saudi Arabia, a study done by Alanazi *et al*. among female secondary school students using Rome IV criteria, the overall prevalence was 54.8%.[13] Another similar study conducted among male secondary school students in Najran city, Saudi Arabia, the IBS prevalence was 39.8%.[8] In Japan, the prevalence of IBS among adolescents was 18.6% with no gender difference.[15] A recent study done in Jazan including 1,554 participants aged from 18 to 69 years old, the overall prevalence was found to be 16% with a higher prevalence among female gender (55.3%).[16] Thus, the females are reported to be at higher risk of suffering from IBS.[2,5,10,17–19]

Healthy lifestyle is the cornerstone of preventing diseases and disabilities. In the present study, majority of the participants reported of not consuming adequate fruits and vegetables and were not physically active. In addition, more than two-thirds (66.6%) of the respondents had consumed soft drinks during the previous week. These findings high-

Table 2. Behavioral and lifestyle characteristics of the study population

Behavioral and lifestyle characteristics	Number	Percentage
Bodyweight perception (n=401)		
Underweight	51	12.7
Normal weight	276	68.8
Overweight	74	18.5
Physical activity for the last 7 days (n=401)		
0 day	160	39.9
1-3 days	174	43.4
4-7 days	67	16.7
Sleeping hours (n=401)		
≤4 hours	31	7.7
5-8 hours	245	61.1
>9 hours	125	31.2
Food source (n=400)		
Home	364	90.8
Restaurant	36	9
Number of meals during the day (n=401)		
One meal	84	20.9
2-3 meals	297	74.1
>3 meals	20	5
Breakfast days during the last 7 days (n=401)		
0 day	88	21.9
1-3days	188	46.9
4-7days	125	31.2
Fruits frequency for the last 7 days (n=401)		
0 time	125	31.2
1-3 times	199	49.6
4 or more	77	19.2
Vegetables frequency for the last 7 days (n=401)		
0 time	89	22.2
1-3 times	190	47.4
4 or more	122	30.4
Soft drinks frequency for the last 7 days (n=401)		
0 time	134	33.4
1-3 times	204	50.9
4 or more	63	15.7
Spicy food preference (n=401)		
No	197	49.1
Yes	204	50.9

Table 4. Association of Irritable Bowel Syndrome (IBS) with health background characteristics of study participants

Health background characteristics	IBS Absent No.	IBS Present No.	Chi-square Value	P value
Mental health assessment for the past 30 days				
Never	41	3	21.829	<0.0001
Rarely	69	10		
Sometimes	141	37		
Most of the times	64	36		
Food allergy				
No	177	42	1.943	0.378
Yes	55	20		
I don't know	83	24		
Family history of IBS				
No	136	7	45.685	<0.0001
Yes	134	71		
I don't know	45	8		
History of chronic disease				
No	293	69	12.574	<0.0001
Yes	22	17		

light the importance of promoting health education, and focusing on healthy lifestyle, in the schools.

In our study, unhealthy diet (high soft drinks intake with low vegetables consumption) is found to be associated with IBS. Other studies have also found association between IBS and poor dietary habits.[6,13,20] In the study by Alanazi *et al*., high prevalence of IBS was observed among students who were consuming low amounts of fruits and vegetables and had frequent soft drinks consumption.[13] Alharbi *et al.* also concluded that inadequate fruits and vegetables intake is a risk factor for developing IBS.[6]

Body image is a sensitive issue for adolescents in general and adolescent females in particular. In our study, weight perception (perceived as underweight or overweight) was significantly associated with IBS. Some researchers have reported no relation between IBS and participants BMI.[21] This contrast may be explained by the fact that our study did not collect information about BMI, and weight perception may not be reflective of participants' BMI.

Poor mental health plays a vital role in the pathophysiology of IBS.[22] In our study poor mental health was statistically significantly associated with IBS (p<0.0001). This finding is in agreement with many other studies.[3,4,16,17,23–26] Moreover, a substantial proportion of participants reporting poor mental health in our study underscores the importance of regular screening for depression and anxiety among secondary school students to avoid the negative impact of poor mental health on their academic and personal life.

Family history of IBS has a significant contribution in the development of the disorder, suggesting that family members share the same living conditions and environment.[22] Also, genetics play a role in the etiology of IBS. The current study found statistically significant association between IBS and family history of IBS (p<0.0001), which is supported by several previous studies.[3,4,8,13,21,24–26] In our study, personal history of chronic disease was identified as a risk factor for IBS (p<0.0001). Previous studies have also reported similar findings.[8,23,26]

LIMITATIONS OF THE STUDY

The current study has certain limitations. First, our study included only adolescent girls, studying in selected secondary schools of a single city. This limits the generalizability of the study. Second, the study was conducted as an online survey through a self-administered questionnaire. Thus, some of the questions might be misunderstood by the participants. However, the questionnaire was pre-tested for clarity and understandability. Third, it was a self-reported survey, and the possibility of social desirability bias cannot be ruled out.

CONCLUSION

The current study found a high prevalence (21.4%) of IBS among female secondary school students in Ar Rass city. The main risk factors were having unhealthy diet, poor mental health, personal history of chronic disease and family history of IBS. Mental health was associated with household income, number of sleeping hours, weight perception, and chronic diseases.

We recommend health care campaigns and programs to increase the awareness of IBS and to highlight the importance of healthy lifestyle. School staff need to be trained to promote the physical and mental health of the students.

ACKNOWLEDGMENTS

We would like to thank all secondary school students who participated in this study. We are grateful to the school administration for facilitating the data colleciton for our study.

We are extremely thankful to Ms. Rogiah Alharbi for her valueble support in data collection for our research project.

AUTHORS' CONTRIBUTION

WAA designed the study, collected the data, performed data analysis, and drafted the manuscript. SJ participated in the design of study, data analysis, and critically revised the manuscript for its intellectual content. WAA had final responsibility to submit for publication. Both authors approved the final version of the manuscript for publication.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

FUNDING

None

CONFERENCE PRESENTATION

None

DATA AVAILABILITY

The data used to support the findings of this study are included within the research article and are available from the corresponding author upon request.

Submitted: March 07, 2022 EDT, Accepted: April 10, 2022 EDT

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