Paediatrica Indonesiana

VOLUME 54 November • 2014 NUMBER 6

Original Article

Irritable bowel syndrome and its associated factors in adolescents

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Abstract

Background Irritable bowel syndrome (IBS) is a common functional gastrointestinal disorder. Increasing prevalences have been reported in Asian adolescent populations, however, there have been few reports on Indonesian adolescents.

Objective To investigate the prevalence of IBS and associated factors among adolescents in Jakarta.

Methods This cross-sectional study included senior high school students in a district of Jakarta. Students were asked to fill questionnaires based on the Rome III criteria for IBS. They were then divided into groups: those with IBS and those without IBS, for the purposes of comparison.

Results Out of 232 adolescents (145 females and 87 males) with mean age of 16.06 (SD 0.91) years, 14 (6.0%) had IBS. Eleven out of 14 adolescents with IBS reported upper abdominal pain as well as periumbilical/lower abdominal pain. Irritable bowel syndrome was not associated with socioeconomic status, food and drink habits, the use of antibiotics, or scolding as a parental form of discipline. However, a significant higher proportion in the use of corporal punishment was found in IBS adolescents compared to the non-IBS (P=0.034). In addition, stress related to scolding, as a parental form of discipline was more likely to be found in the IBS group than in the non-IBS group (P=0.019).

Conclusion The prevalence of IBS among adolescents in Jakarta is 6%, which is lower compared to those of other Asian countries. Corporal punishment at home and stress related to scolding at home are found to be associated with IBS. **[Paediatr Indones. 2014;54:344-50.]**

Keywords: *Irritable bowel syndrome, Rome criteria III, abdominal pain, altered bowel habit, adolescents*

Irritable bowel syndrome (IBS) is a functional gastrointestinal (GI) disorder of the bowel, characterized by abdominal pain or discomfort, bloating, and disturbed defecation patterns (diarrhea, constipation, or fluctuation between the two).[1,2] As such, IBS is considered to be a major health problem, due to increased absenteeism from school and decreased quality of life (QOL).[3-5]

The reported prevalence of IBS was 10-20% in Western countries,[4] and 2.9-15.6% in Asian countries,[6-8] with higher prevalences among Asian adolescents (5.8-25.7%) compared to adults.[8-10] The variations in prevalence might be related to demographic characteristics, willingness to respond to questionnaires, geographical location, and the criteria used to define IBS (Manning, Rome criteria I, II, and III).[11] Factors that contribute to the increasing prevalence in Asian countries are unknown, however, adaptation to a "Western lifestyle," improved hygiene, increased overcrowding, stress, and changes in diet, are thought to be major contributors.[12]

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To date, there have been few reports on the prevalence of IBS in Asian countries. Moreover, to the authors' knowledge there have been no reports from an Indonesian population on the prevalence of IBS in adolescents and factors that contribute to IBS symptoms. Therefore, we conducted a population-based study to investigate the prevalence of IBS among adolescents and factors associated with IBS symptoms in high school students in Jakarta, Indonesia.

Methods

A cross-sectional study was carried out in senior high school students of Sekolah Menengah Atas Negeri (SMAN) 68 in Jakarta between March and April 2013. Four classes of each grade were randomly selected for those students to fill out a self-report questionnaire. This school was chosen for this study because it is a public senior high school with students of different socioeconomic backgrounds, and thought to reflect a diverse adolescent population. Students included in this study provided parental written informed consent. This study was approved by the Medical Ethics Committee of the Faculty of Medicine at the University of Indonesia.

Questionnaires were distributed to all eligible students in selected classes for them to fill at home. All completed questionnaires were collected and evaluated, while uncompleted questionnaires were excluded. The questionnaire consisted of questions on digestive system symptoms and related factors, based on the Rome III criteria.[13] The self-report questionnaire was translated to the Indonesian language and validated by means of retranslation. For further validation, the questionnaire was filled by eleven high school students, in order to evaluate their understanding of the questions.

The diagnosis of IBS in children or adolescents must include both of the following: (1) abdominal discomfort or pain associated with two or more of the following at least 25% of the time: (a) improvement with defecation, (b) onset associated with a change in frequency of stool, (c) onset associated with a change in form (appearance) of stool; and (2) no evidence of an inflammatory, anatomic, metabolic, or neoplastic process that explains the subject's symptoms. Criteria were considered to be fulfilled if they occurred at least once per week for at least two months prior to diagnosis.[13]

The questionnaire also contained questions to investigate factors associated with IBS, such as gender, age, and academic achievement, as well as factors related to their socioeconomic status, antibiotic use, food and drink habits (wheat products, milk, caffeine and energy drinks), and parents' form of discipline (scolding and corporal punishment). To investigate factors related to their socioeconomic status, we collected data on the parental educational level, their daily caregiver, number of siblings, and monthly parental salary. Based on the World Bank Group's main criterion for classifying economies in gross national income (GNI) per capita for 2011, the salary per month in Indonesian Rupiah (IDR) were categorized into four groups: low income (< IDR 835,000), lower middle income (≥ IDR 835,000 – < IDR 3,280,000), upper middle income (≥ IDR 3,280,000 – < IDR 10,140,000), and high income (≥ IDR 10,140,000).

All data were analyzed by the *Statistical Package for Social Science (SPSS) 17.0*. We compared factors associated with IBS between the with and without IBS groups. Intergroup comparisons were performed using the Chi-square test for categorical data. For comparisons that did not meet the requirement, were grouped the variables or used the Fischer's exact test as an alternative. Numerical data were analyzed using the independent T-test with an alternative Mann-Whitney U test. Statistical significance was accepted at $P<0.05$.

Results

Three hundred eighty-five questionnaires were distributed, of which 232 questionnaires were eligible and collected for analysis, a 60.3% response rate. The low response rate may have been due to poor timing, as questionnaires were distributed the week before national exams were held.

The age of subjects ranged from 13 to 18 years, with a mean age of 16.06 (SD 0.91) years. Subjects were 62.5% female and 37.5% male. Of the 232 subjects, 83 (35.8%) were in 10th grade, 83 (35.8%) were in 11th grade, and 66 (28.4%) were in 12th grade. A total of 93.1% of the students were raised by their parents and most students had two or three

siblings (44%). Most parents had attained the highest educational level of Bachelor's degree (45.7%). Most subjects (50.4%) were in the upper middle income category for socioeconomic status (**Table 1**).

Fourteen out of 232 subjects were classified as suffering from IBS, a prevalence of 6.0% in high school students. **Table 2** shows the distribution of symptoms among adolescents with IBS. Twelve of 14 subjects with IBS reported upper abdominal pain/discomfort associated with bowel symptoms; 13 subjects reported periumbilical/lower abdominal pain/discomfort with bowel symptoms; and 11 subjects with IBS had upper abdominal pain as well as periumbilical/lower abdominal pain/discomfort. The combination of upper and periumbilical/lower abdominal pain, was more often accompanied by softer and/or watery feces and a higher frequency of defecation.

We also compared the frequencies of several factors previously reported to be associated with IBS, between the two groups (**Table 3**). There were no

Table 1. Demographic characteristics of subjects

Demographic characteristics		n=232
Gender, n (%)	Male	87 (37.5)
	Female	145 (62.5)
Grade level, n (%)	10th grade	83 (35.8)
	11th grade	83 (35.8)
	12th grade	66 (28.4)
Daily caregiver, n (%)	Parents	216 (93.1)
	Grandparents	8 (3.4)
	Uncle or aunt	3 (1.3)
	Someone else	5 (2.2)
Number of siblings, n (%)	0	15 (6.5)
	1	93 (40.1)
	2 or 3	102 (44)
	4 or more	22 (9.5)
Socioeconomic status, n (%)	< IDR 835,000	2 (0.9)
	≥ IDR 835,000 – < IDR 3,280,000	27 (11.6)
	≥ IDR 3,280,000 – < 10,140,000	117 (50.4)
	≥ IDR 10,140,000	86 (37.1)

Table 2. Distribution of symptoms in adolescents with IBS

Symptoms of IBS	IBS subject number													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Upper abdominal pain or discomfort														
Once per week or more often	-	√	√	√	-	√	√	-	√	√	-	√	√	√
Duration: 2 months or longer	√	√	√	√	-	√	√	-	√	√	√	√	√	√
Relief with defecation*	√	√	-	√	-	√	-	-	-	-	-	-	√	√
Change in bowel movement form: softer*	√	√	√	-	-	√	√	-	√	-	√	-	√	√
Change in bowel movement form: harder*	√	√	√	-	-	-	√	-	-	-	√	-	-	√
Change in bowel movement frequency: more often*	√	√	-	√	-	√	√	-	-	-	-	-	-	-
Change in bowel movement frequency: less often*	√	√	√	-	-	-	√	-	√	-	-	-	-	-
Periumbilical/lower abdominal pain/discomfort														
Once per week or more often	√	√	√	-	√	√	-	√	-	√	√	√	-	√
Duration: 2 months or longer	√	√	√	√	√	√	-	√	-	√	√	√	-	√
Relief with defecation*	-	√	-	√	√	√	-	√	-	√	√	√	-	√
Change in bowel movement form: softer*	√	√	-	-	√	√	-	√	-	√	√	√	√	-
Change in bowel movement form: harder*	√	√	-	√	√	-	-	-	-	-	-	√	-	√
Change in bowel movement frequency: more often *	√	√	-	√	-	√	-	√	-	√	√	√	√	√
Change in bowel movement frequency: less often *	√	√	-	√	-	-	-	-	√	-	-	-	-	√

* It occurs "sometimes" or more often

significant differences between the IBS and non-IBS groups for gender, students' grade levels, academic achievement, parental education level, socioeconomic status, number of siblings, daily caregiver, antibiotic consumption, or drinking (consumption of milk, coffee or energy drinks) and eating (bread) habits.

To explore other factors that may be related to IBS in adolescents, we also analyzed the relationship between IBS and parents' form of discipline, such as scolding and corporal punishment. Both scolding and corporal punishment occured more often in the IBS group than the non-IBS group. However, we found a significant difference only in corporal punishment between the IBS and non-IBS groups (P =0.038) (**Table 3**).

We further analyzed subjects whose parents used scolding or corporal punishment, as a form of disciplining children. The subjects were also asked if they experienced stress when they received scolding or

Table 3. Comparison of potential contributing factors to IBS between IBS and non-IBS groups

Characteristics	Categories	Subject		P value
		IBS (n=14)	Non-IBS (n=218)	
Gender	Male	3	84	0.200*
	Female	11	134	
Class year	10th and 11th grades	9	157	0.548+
	12th grade	5	61	
Academic records	Low & average score	14	215	1.000+
	High score	0	3	
Paternal educational level	< university level	2	48	0.740+
	≥ university level	12	170	
Maternal educational level	< university level	4	91	0.331*
	≥ university level	10	127	
Sosioeconomic status	< IDR 3,280.000	1	28	1.000+
	≥ IDR 3,280,000	13	190	
Siblings	0 or 1	8	100	0.412*
	2 or more	6	118	
Daily caregiver	Parents	13	203	1.000+
	Other	1	15	
Antibiotic usage in the past 2 months	0	5	126	0.106*
	≥ 1	9	94	
Eating bread	< once daily	9	112	0.349*
	≥ once daily	5	106	
Drinking coffee	< once daily	10	188	0.131+
	≥ once daily	4	30	
Drinking energy drink	< once daily	13	189	1.000+
	≥ once daily	1	29	
Drinking milk	< once daily	5	51	0.335+
	≥ once daily	9	167	
Scolded	Never	2	59	0.336+
	Sometimes or always	12	159	
Corporal punishment	Never	9	189	0.038+
	Sometimes or always	5	29	

IDR: Indonesian Rupiah; *Chi-square test; +Fischer's exact test; statistical significance accepted at P<0.05

Table 4. Prevalence of IBS with regards to stress related to scolding

Characteristics	Categories	Subjects		P value*
		IBS (n=12)	Non-IBS (n=157)**	
Stress related to scolding, n (%)	Never	0	50	0.019**
	Sometimes or always	12	107	

*Two adolescents in non-IBS group did not answer this question about the relationship of scolding and stress

** Fischer's exact test

corporal punishment from their parents. All of 12 IBS subjects felt stress when subjected to such discipline, while 31.8% (50/157) of subjects in the non-IBS group never experienced stress when scolded by their parents (P = 0.019). Moreover, 15 out of 29 subjects in the non-IBS group never experienced stress when they received corporal punishment by their parents (**Tables 4** and **5**).

Table 5. Prevalence of IBS with regards to stress related to corporal punishment

Characteristics	Categories	Subjects		P value*
		IBS (n=5)	Non-IBS (n=29)	
Stress related to corporal punishment, n (%)	Never	0	15	0.053
	Sometimes	5	14	

* Fischer's exact test

Discussion

Irritable bowel syndrome is a common disorder with higher prevalences in Western than Asian countries, with variations in regions, age, gender, race, occupation, socioeconomic status, and educational level.[9,10,14,15] We found the prevalence of IBS among high school students to be 6.0%. This finding was lower than the 11.44-17.35% among Chinese adolescents aged 13-17 years using the Rome II criteria.[14] The prevalence of IBS varies greatly among epidemiological studies, potentially due to several factors such as inclusion of different diagnostic criteria, gender distributions, and willingness to respond to questionnaires. The Manning criteria appears to yield higher values compared to either the Rome I or II criteria.[16] In our study, we used the *Rome III Diagnostic Questionnaire for Pediatric Functional GI Disorders* to diagnose IBS. The Rome III criteria have also been used in adult studies.[3,17] Students were asked about their history of symptoms in the two months prior, using a questionnaire specifically made for children and adolescents. This questionnaire was different from the adult questionnaire, in which criteria had to be fulfilled for the prior three months with symptom onset at least six months prior to diagnosis.

Eleven out of 14 subjects with IBS in our study reported upper and periumbilical/lower abdominal pain/discomfort with higher frequency of stools and softer/mushy/watery stool consistency. Only 1/14 of IBS subjects reported upper abdominal pain/discomfort associated with bowel symptoms without lower abdominal pain. Moreover, only 2/14 of IBS subjects reported periumbilical/lower abdominal pain/discomfort with bowel symptoms without upper abdominal pain. These symptoms were probably due to the interaction of several factors such as visceral perception, central regulation of sensory input as influenced by psychosocial factors, abnormalities in motility and secretion, as well as intraluminal factors and inflammatory mediators. Irritable bowel syndrome symptoms often affect patients' quality of life (QoL), sometimes causing severe decreases.[3,4,18] The aforementioned factors probably explained why our subjects had upper as well as lower abdominal pain/discomfort at the same time.

In this study, we further investigated some potential contributing factors to IBS. We found no significant difference in gender distribution between the IBS and non-IBS groups (P=0.200). Similarly, other studies in Asian countries found no significant difference in the proportion of males and females.[14,17] To assess for an association between IBS and socioeconomic status, we divided subjects into two income groups: <IDR 3,280,000 and ≥IDR 3,280,000. There was no significant difference in socioeconomic status between the IBS and non-IBS groups (P=1.000). Furthermore, we found no significant difference between the two groups with regards to students' class year. In contrast, a study found a significantly higher proportion of IBS in the higher grade students.[3] As for academic achievement, students were categorized as low score (score <75), average score (score 75 – 88), or high score (score ≥89). We found no significant difference in academic achievement between the two groups.

Studies have suggested that there is no single, unifying cause to explain the symptoms of IBS. Abdominal pain or discomfort is related to combinations of several known physiological determinants such as dysmotility, visceral hypersensitivity, mucosal immune

dysregulation, alterations of bacterial flora, and central nervous system – enteral nervous system (CNS-ENS) dysregulation.[1,2] Associations between IBS symptoms and specific foods has also been reported, most commonly those containing milk and wheat products, caffeine, fructose, and certain meats.[14,18-22]

Antibiotic therapy has also been suggested to increase the development of IBS after traveler's diarrhea resulting from prolonged changes in bowel flora.[20] Mendall *et al.* showed that the association between antibiotic use and IBS could be causal. They investigated antibiotic prescriptions for different types of infections in the previous year, and found a strong association between IBS symptoms and the use of antibiotics.[23] Self-medication with antibiotics is common in urban populations of Indonesia.[24] In our study, although the IBS group had more students who had used one or more antibiotics compared to the non-IBS group, we found no significant difference in the use of antibiotics between groups. This finding may be due to the shorter length of observation (antibiotic use in the prior 2 months) compared to 1 year in the Mendall *et al*. study. Another study also found an association between the use of antibiotics and the development of IBS.[20]

We also found that drinking more coffee and less milk were more common in the IBS group than in the non-IBS group (> once per day coffee: 28.6% vs. 13.8%, respectively; < once per day milk: 35.7% vs. 23.4%, respectively). However, these differences were not significant (P=0.131 and P=0.335, respectively). Similar findings were also reported by Nanda *et al*., who found that 23% of IBS subjects avoided milk completely.[25]

To investigate the relationship between stress and IBS we asked adolescents about the forms of discipline at home. Although there was no significant difference between the stresses experienced by corporal punishment, we found that subjects in the IBS group were more likely to experience stress when scolded by their parents (P= 0.019). In contrast, Liu Dong *et al.* did not find a relationship between the stress of school work and parents' disciplinary forms to IBS.[14] Park *et al.* also found no significant relationship between examination-related stress and IBS.[3] However, the higher prevalence among students with IBS who experienced stress by scolding and corporal punishment were reported by other previous studies. Different studies have shown that many IBS patients report that stress aggravates their symptoms.[9,10] The stress hormone corticotrophin-releasing factor (CRF) can activate mast cells and lead to an increase in colon permeability.[26]

Limitations of our study are the small number of subjects compared to the population of Jakarta, and the small number of subjects with IBS. Therefore, further studies should be done to gain representative data from Indonesia and to more clearly define the contributing factors of IBS among Indonesian adolescents.

In conclusion, the prevalence of IBS among senior high school students in Jakarta is 6.0%. Eleven out of 14 adolescents with IBS report upper abdominal pain as well as periumbilical/lower abdominal pain. A significant higher proportion is found in IBS compared to non-IBS groups in corporal punishment at home, and stress related to scolding. Therefore, we suggest that stress as an associated factor of IBS warrants further investigation.

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