

## Risk factors of recurrent abdominal pain in adolescents

Muzal Kadim, Anjar Setiani, Aryono Hendarto

### Abstract

**Background** Recurrent abdominal pain is 2-4% of all cases encountered by pediatricians. Risk factors vary among countries. There is no data on prevalence and risk factors of recurrent abdominal pain in adolescents in Indonesia.

**Objective** To evaluate prevalence and risk factors of recurrent abdominal pain in junior high school students.

**Methods** A cross-sectional study was performed among junior high school students in South Jakarta who experienced recurrent abdominal pain according to Roma III criteria. Students allowed by their parents to participate to this study were asked to complete a Roma III questionnaire. Data about sociodemographic and history of recurrent abdominal pain among the parents were also collected using a questionnaire.

**Results** Three hundred ninety-six adolescents participated in this study, 17.2% among them experiencing recurrent abdominal pain. Irritable bowel syndrome (IBS) was the most common type (42.6%), followed by functional dyspepsia (30.9%), functional abdominal pain syndrome (11.8%), functional abdominal pain (10.3%), and abdominal migraine (4.4%). The risk factor most responsible was anxious personality (OR 3.86; 95%CI 2.05 to 7.29,  $P < 0.001$ ). Other risk factors that contribute were female, age > 13 years, and middle to lower family income.

**Conclusions** Prevalence of recurrent abdominal pain in adolescents is 17.2%. Irritable bowel syndrome is the most common type. The risk factors are anxious personality, female, age > 13 years, and middle to lower family income. [Paediatr Indones. 2021;61:141-8; DOI: 10.14238/pi61.2.2021.141-8 ].

**Keywords:** adolescent; recurrent abdominal pain; risk factor; Rome III

Recurrent abdominal pain is one of common symptom complained by at doctor visits. These complaints cover 2-4% of the reason for visiting pediatrician.<sup>1</sup> Differences in prevalence of organic disease are reported depending on the setting, ranging from 5% in the general population to 40% in a pediatric gastroenterologist patients.<sup>2</sup> The prevalence of recurrent abdominal pain in school-aged children in developed countries is approximately 10-12%.<sup>3</sup> Epidemiological studies in Asia showed also the similar results. Studies in Malaysia on children aged 11-16 years showed prevalence of 10.2% (rural) and 9.6% (urban) in children aged 9-15 years.<sup>4,5</sup> The same prevalence was reported in Bangladesh (11.5%) and Sri Lanka (10.5%).<sup>6-8</sup> Some studies show the prevalence of recurrent abdominal pain varies by age and gender. Recurrent abdominal pain usually occurs in children aged 5-14 years and it decreases among older children. Abdominal pain is uncommon in children under five years of age.<sup>9</sup> Girls are more tend

From the Department of Child Health, Universitas Indonesia Medical School/Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia.

**Corresponding author:** Muzal Kadim, Department of Child Health, Universitas Indonesia Medical School/Dr. Cipto Mangunkusumo National Hospital, Jakarta, Indonesia. Telp. +62-818193219; Email: muzalk@yahoo.com.

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to suffer from recurrent abdominal pain than boys. In girls, the highest frequency were occurred in the age of 8-12 years, whereas in boys aged 5-10 tahun.<sup>9</sup> Study in Malaysia showed no significant difference between boys and girls.<sup>4</sup>

The current study are mostly mentioned various things that are considered as risk factors for recurrent abdominal pain in children; namely: age, gender, number of siblings, stress, anxious personality type, family history of recurrent abdominal pain, as well as the parental level of education, employment, and income.<sup>5-9</sup>

The more organic pathology can be found along with the increasing advancement of science and medical diagnostic tools. Only cases that may be related to organic disorders, the cases with the warning signs, requires further investigations.<sup>1-3</sup>

The mechanism of recurrent abdominal pain in children is still unclear. Studies trying to find the exact cause and mechanism of recurrent abdominal pain in children are still few. Several hypotheses made to explain the occurrence of recurrent abdominal pain, including visceral hyperalgesia, dysmotility, interaction of the 'brain-gut', inflammation, immunity, genetics, stress conditions, and biopsychosocial.<sup>10-12</sup>

Very limited data on prevalence and risk factors for recurrent abdominal pain in adolescents children in Indonesia. Therefore, this study aimed to determine the prevalence and risk factors of recurrent abdominal pain in junior high school students in South Jakarta,, Indonesia

## Methods

This study was a cross-sectional analytical study conducted in two junior high schools in South Jakarta, in January to June 2013. The inclusion criteria in this study were junior high school students of class VII-IX and the parents agreed to include their children in this study. The exclusion criteria were students who did not answer or fill in the data completely and clearly on the questionnaire and could not be reached to clarify the incomplete or unclear data.

Recurrent abdominal pain in children was defined as pain that waxes and wanes, occurs for at least three episodes within three months, and was severe enough to affect the child's activities.<sup>13</sup> Functional

disorders were those that cannot be explained by structural or biochemical abnormalities.

In this study, sample size required was 384. The junior high schools were selected randomly, while the subjects were recruited in consecutive sampling method. This study was approved by the Research Ethics Committee of the Universitas Indonesia Medical School, Jakarta.

Researchers went to selected junior high schools and set a class of students which were going to be the subject of the study. Before filling out the questionnaire, the students and their parents were collected to be given an explanation on how to fill out the questionnaire. Parents/caregivers and students then signed the informed consent. Questionnaires were filled in together in the class with the students' parents. If there were unanswered or unclear questions or answers, the researchers would ask the same items over the phone. The questionnaires used were the questionnaires that had been translated from English to Indonesian language, and had been validated. Except for sociodemographic data, the questionnaire contained closed questions, so that the subject simply chose the answer. The questionnaire for parents was different from the questionnaire for students. The questionnaire for parents mainly contained sociodemographic data and a history of functional recurrent abdominal pain in parents, while the questionnaire for students was completed by student him/herself, to look for recurrent abdominal pain in the last 3 months.

Students consented to participate in the study were given a questionnaire consisted of questions related directly to the criteria of recurrent abdominal pain using Rome III diagnostic questionnaire of *Rome Foundation* which had been validated, the self-report form for children and adolescents (aged 10 years or more). Recurrent abdominal pain was determined if the answers meet the criteria of Rome III.<sup>14</sup> In addition, to determine the factors related to the occurrence of recurrent abdominal pain, subjects were asked to fill the *Strength and Difficulties Questionnaire* (SDQ).<sup>15</sup> The SDQ was a domain specific questionnaire for emotional disorders to determine whether the subject was anxious or not.

Parent's education level was defined as lower education if they were graduated from junior high school or equivalent, and high education if from high school or equivalent, while higher education

level meant they graduated from college or higher. Parental job was classified as administrative (civil servant, military, doctor, private employee, teacher), or non-administrative (traders, farmers, fishermen, laborers, tailors, etc). Family's income based on monthly expenses, was classified as lower if it was less than 1.1 million rupiahs, high between 1.1 million to 5 million, and higher if it was more than 5 million rupiahs per month.

Statistical tests used for unpaired categorical variables was Chi-square test. Multivariate analysis was performed based on dependent variables. Variables incorporated into the multivariate analysis were the variables which had a P value of  $<0.25$  in the bivariate analysis.

## Results

Subjects who met the study criteria were 396 students. Distribution of the study subjects according to socio-demographic characteristics are shown in **Table 1**. The majority of the study subjects were girls (59.8%). Their mean age was 12.73 (SD 0.861) years with most age was 13 years (43.7%). Mother and father of the subjects were mostly had a higher educational background (63.6% and 52.0%). Only 14.4% of the subjects who had parents with the lower income.

The prevalence of recurrent abdominal pain in junior high school students in this study was 17.2%. Type of recurrent abdominal pain mostly was irritable bowel syndrome (IBS) in 42.6%, then followed by functional dyspepsia (30.9%), functional abdominal pain syndrome (11.8%), functional abdominal pain (10.3%), and abdominal migraine (4.4%). Prevalence and type of recurrent abdominal pain based on the results of this study are shown in **Table 2**.

The relationships between risk factors and recurrent abdominal pain are seen in **Table 3**. Of the 12 risk factors assessed, only 3 had statistically significant relationship with recurrent abdominal pain; those were gender (OR 2.765; 95%CI 1.498 to 5.106;  $P=0.001$ ), age of  $< 13$  years ( $P=0.026$ ), and anxious personality type (OR 4.867; 95 CI 2.658 to 8.912;  $P<0.001$ ).

In this study, a multivariate analysis using SPSS for Windows version 17.0 with backward stepwise method (Backward LR) was used. Variables included in the multivariate analysis were variables in the bivariate

**Table 1.** Distribution of study subjects based on socio-demographic characteristics

Socio-demographic characteristics	N=396
Sex, n(%)	
Male	159 (40.2)
Female	237 (59.8)
Age, n(%)	
< 13 years	153 (38.6)
13 - < 14 years	173 (43.7)
> 14 years	70 (17.7)
Number of children in the family, n(%)	
One	27 (6.8)
2-3 children	341 (86.1)
>4 children	28 (7.1)
Father educational level, n(%)	
Lower	40 (10.1)
High	104 (26.3)
Higher	252 (63.6)
Mother educational level, n(%)	
Lower	52 (13.1)
High	138 (34.9)
Higher	206 (52.0)
Father occupation, n(%)	
Jobless	10 (2.5)
Administrative	258 (65.2)
Non-administrative	128 (32.3)
Mother occupation, n(%)	
Housewives	240 (60.6)
Administrative	118 (29.8)
Non-administrative	38 (9.6)
Family income, n(%)	
Lower	57 (14.4)
High	164 (41.4)
Higher	175 (44.2)

**Table 2.** Prevalence of recurrent abdominal pain in junior high school students

Variables	N=396
No recurrent abdominal pain, n(%)	328 (82.8)
With recurrent abdominal pain, n(%)	68 (17.2)
Abdominal migraine	3 (4.4)
Irritable bowel syndrome (IBS)	29 (42.6)
Functional dyspepsia	21 (30.9)
Functional abdominal pain	7 (10.3)
Functional abdominal pain syndrome	8 (11.8)

analysis which showed a P-value of  $<0.25$ , those were gender, age, type of anxious personality, family income, and stressful conditions at home. **Table 4** shows that at the end of a multivariate analysis, the risk factors reached statistical significance were anxious personality type, gender, age, and family income.

**Table 3.** Bivariate analysis of risk factors and recurrent abdominal pain

Risk factors	Recurrent abdominal pain		OR (95% CI)	P value
	Yes (n=68)	No (n=328)		
Sex, n(%)				
Female	53 (22.4)	184 (77.6)	2.765 (1.498 to 5.106)	0.001
Male	15 (9.4)	144 (90.6)		
Age, n(%)				
< 13 years	22 (14.4)	131 (85.6)	Ref	0.026
13- <14 years	27 (15.6)	146 (84.4)		
>14 years	19 (27.1)	51 (72.9)		
Anxious personality type, n(%)				
Yes	25 (41.7)	35 (58.3)	4.867 (2.658 to 8.912)	< 0.001
No	43 (12.8)	293 (87.2)		
Number of children, n(%)				
One	1 (3.7)	26 (96.3)	1.052 (0.385 to 2.874)	1.000**
>1 sibling*	67 (18.2)	302 (81.8)		
Father educational level, (%)				
Lower-high*	28 (19.4)	116 (80.6)	0.782 (0.459 to 1.332)	0.365
Higher	40 (15.9)	212 (84.1)		
Mother educational level, n(%)				
Lower-high*	35 (18.4)	155 (81.6)	0.845 (0.501 to 1.425)	0.527
Higher	33 (16.0)	173 (84.0)		
Father occupation, n(%)				
Non-administrative*	23 (16.7)	115 (83.3)	1.056 (0.609 to 1.833)	0.845
Administrative	45 (17.4)	213 (82.6)		
Mother occupation, n(%)				
Non-administrative*	46 (16.5)	232 (83.5)	1.156 (0.660 to 2.025)	0.613
Administrative	22 (18.6)	96 (81.4)		
Family income, n(%)				
Lower-high*	44 (19.9)	177 (80.1)	1.564 (0.909 to 2.691)	0.105
Higher	24 (13.7)	151 (86.3)		
Stressful condition at home, n(%)				
Yes	13 (24.1)	41 (75.9)	1.655 (0.832 to 3.290)	0.148
No	55 (16.1)	287 (83.9)		
Stressful condition at school, n(%)				
Yes	29 (18.7)	126 (81.3)	1.192 (0.702 to 2.024)	0.515
No	39 (16.2)	202 (83.8)		
Family history of recurrent abdominal pain, n(%)				
Yes	4 (28.6)	10 (71.4)	1.988 (0.605 to 6.534)	0.274**
No	64 (16.8)	318 (83.2)		

\*Re-categorical to meet Chi-square requirements; \*\* Fisher test

**Table 4.** Logistic regression analysis between risk factors of recurrent abdominal pain

Determinant variables	OR (95%CI)	P value
Anxious personality type	3.864 (2.049-7.286)	<0.001
Female sex	2.443 (2.267-7.782)	0.007
Age		
<13 years	Ref	Ref
13 - <14 years	2.126 (1.032-4.378)	0.041
>14 years	2.201 (1.042-4.650)	0.039
Family income lower-high	1.802 (1.011-3.210)	0.046

Ref=reference

## Discussion

The prevalence of recurrent abdominal pain in junior high school students in this study was 17.2% (Table 2). This prevalence is higher than the prevalence of recurrent abdominal pain in school-age children in developed countries which are 10-12%.<sup>2,4</sup> Epidemiological studies in some developed countries in Asia showed similar results. Studies in Malaysia in children aged 11-16 years showed prevalence of

10.2% (rural) while in urban children aged 9-15 years was 9.6%.<sup>5,6</sup> Another study conducted in Bangladesh in children aged 7-15 years showed prevalence of 11.5%, while prevalence in Sri Lanka in children aged 5-15 years was 10.5%.<sup>7,8</sup> The prevalence variability may be due to differences in diagnostic criteria used. Most previous studies using the diagnostic criteria for recurrent abdominal pain in Apley,<sup>13</sup> while this study using Rome III diagnostic criteria which is the latest diagnostic criteria that have been standardized and widely accepted. The Rome III diagnostic criteria can specify the type of recurrent abdominal pain which can not be assessed using the Apley criteria.

In this study, most of the type of recurrent abdominal pain were irritable bowel syndrome/IBS (42.6%) (Table 2). Other types are functional dyspepsia (30.9%), functional abdominal pain syndrome (11.8%), functional abdominal pain (10.3%), and abdominal migraine (4.4%). Types of recurrent abdominal pain differ across the country. The same results were reported in a study conducted in Europe using the diagnostic criteria of Rome II, which indicates that the type of recurrent abdominal pain mostly was IBS.<sup>16</sup> Another study aimed to determine the type of recurrent abdominal pain on children in the UK using the diagnostic criteria of Rome II, revealed the same results that IBS was the most type of recurrent abdominal pain (44.9%), followed by functional dyspepsia (15.9%), functional abdominal pain (7.5%), and abdominal migraine (4.7%).<sup>17</sup> In contrast to the results in this study, a previous study conducted in North America using the Rome II diagnostic criteria showed that most type was functional dyspepsia.<sup>18</sup> However, this study has great recall bias. A study on children in Sri Lanka using the Rome III diagnostic criteria found that the type of recurrent abdominal pain mostly was functional abdominal pain (45.2%).<sup>28</sup> However, sample in the study was too small (55 subjects) to be used as a basis for making conclusions.

Risk factors for recurrent abdominal pain in children are different in every country around the world and even between countries in Asia. Of the 12 risk factors evaluated in this study, there were four risk factors that had significant influence against the increased risk of recurrent abdominal pain on adolescents, those were anxious personality type, gender, parental income, and age.

Apley and Naish show that recurrent abdominal

pain is more common in anxious, fearful and worrisome children.<sup>3</sup> In this study, anxious personality type is the most influential risk factor than 3 other risk factors. The results showed that children with anxious personality type have 3.9 times greater risk of experiencing recurrent abdominal pain than children who are not anxious (OR 3.864; 95%CI from 2.049 to 7.286;  $P < 0.001$ ). In the group of anxious and non-anxious, most of the subjects experienced moderate abdominal pain. A study also suggests a relationship between anxious personality type and recurrent abdominal pain (OR 3.33; 95%CI 2.84 to 3.91).<sup>19</sup> Another study conducted to determine the role of psychosocial factors in children with recurrent abdominal pain (RAP), showed 38.7% of children with RAP had anxious personality type compared to the control (20.5%) and this difference was statistically significant.<sup>12</sup> Similar results was revealed by another study which also showed that children with RAP had a higher anxiety scores than control.<sup>20</sup>

Children who experience recurrent abdominal pain are not confident in their ability to deal with daily stress compared to children who did not experience recurrent abdominal pain. They tend to be less accommodative using coping strategies such as receiving stress, re-framing the significance of the causes of stress, or encouraging themselves to keep forward.<sup>21</sup> Anxiety symptoms in children who experience recurrent abdominal pain are directly related to passive countermeasures (passive coping) and inversely related to self-efficacy and social support. How does a child deal with stress is one of the key management of recurrent abdominal pain.<sup>22</sup>

In our study, girls experienced more recurrent abdominal pain (22.4%) than boys (9.4%). Moderate abdominal pain experienced by most (47%) female subjects, while most of the male subjects (53%) experienced mild abdominal pain. The results showed that girls had 2.4 times greater risk of experiencing recurrent abdominal pain than boys (OR 2.443; 95%CI 2.267 to 7.782,  $P = 0.007$ ). The similar result was shown by a study conducted in Australia, which reported girls experienced more recurrent abdominal pain (52%) than boys (35%).<sup>9</sup> Study in the UK also showed recurrent abdominal pain is more common in girls.<sup>17</sup>

There were 53 female subjects who experienced recurrent abdominal pain. Forty-two percent of the 53

subjects had anxious personality, while only 20% of 15 male subjects had anxious personality. This may explain why girls experienced more recurrent abdominal pain than boys.

The majority of subjects had high family income. In the bivariate analysis, the incorporation of lower and high- income categories was done to fulfill the requirements for Chi-Square test. Results of bivariate analysis (**Table 3**) indicate that the low-high-family income did not significantly associate with the incidence of recurrent abdominal pain (OR 1.564; 95%CI 0.909 to 2.691;  $P=0.105$ ). However, in multivariate analysis (**Table 4**) lower-high family income was proven to have a statistically significant effect on the occurrence of recurrent abdominal pain (OR 1.802; 95%CI 1.011 to 3.210;  $P=0.046$ ). The same results were obtained in a study which showed that the low-high socioeconomic status was more common in subjects with recurrent abdominal pain compared to control (88.5% vs. 11.5%,  $P=0.0086$ ).<sup>12</sup> Previous studies in Malaysia showed that children from low family income had higher risk of recurrent abdominal pain.<sup>5,6</sup> Relationship between family income and recurring abdominal pain is unclear. Low income can lead to stress of not being able to fulfill daily living needs. It is generally assumed that the physical and social stress can trigger symptoms of abdominal pain. This is due to a communication breakdown of peripheral afferent nerves to the central nervous system in the processing of sensory stimuli, so that efferent nerve fibers transmitted pain signals to the intestine. Cortical pain perception and memory contribute to this process, so that the various extrinsic sensations (such as odors) or cognitive processes (such as emotions) can influence the function of gastrointestinal.<sup>20-22</sup> Further studies are needed to clarify this issue.

Recurrent abdominal pain usually occurs in children aged 5-14 years and decreases after that age group. Abdominal pain is uncommon in children under five years of age.<sup>3,9</sup> A study in Malaysia showed the prevalence of recurrent abdominal pain differs at various age groups, i.e. 10.6% in the age group of 11-12 years, 9.5% in the age group of 13-14 years, and 11.9% in the 15-16 age group.<sup>5</sup> This study also found the prevalence of recurrent abdominal pain were different at various age groups, i.e. 14.4% in the age group of 11-12 years, 15.6% in the age group of 13 years, and 27.1% in the age group of >14 years.

These differences can be caused by subjects aged >14 years who experienced recurrent abdominal pain mostly had anxious personality (58%), compared to subjects at the 13 years of age group (33%) and 11-12 years of age group (23%). In all three age groups, the majority of subjects experienced moderate degrees of abdominal pain. Based on the multivariate analysis of our study (**Table 4**), children aged >13 years had 2 times greater risk of experiencing recurrent abdominal pain compared to children aged 11-12 years.

Psychogenic factors due to problems in the family is a major cause of recurrent abdominal pain in children. A study showed that the conditions of family with one parent (single parent) had a strong influence on the occurrence of recurrent abdominal pain.<sup>23</sup> Our study has been questioned a variety of things that could cause stress at home. Most subjects did not experience stress at home (86.4%). The bivariate analysis showed that stressful conditions at home (**Table 3**) contributed to the occurrence of recurrent abdominal pain as OR 1.655; 95%CI 0.832 to 3.290;  $P=0.148$ ). This result, although not reaching statistically significant value, still gives the impression that stressful conditions at home may have a role in the occurrence of recurrent abdominal pain in adolescents.

Children whose parents and siblings suffer from recurrent abdominal pain have increases risk of recurrent abdominal pain.<sup>19</sup> A previous study showed that a history of peptic ulcers or other gastrointestinal disorders on one or both parents increased the occurrence of recurrent abdominal pain in their child.<sup>23</sup> Our study showed that history of recurrent abdominal pain in the family did not have a significant relationship with the occurrence of recurrent abdominal pain (OR 1.988; 95%CI 0.605 to 6.534;  $P=0.274$ ) (**Table 3**). This can be due the assessment of history of recurrent abdominal pain was conducted only on the parent, not to all family members. Mothers of children with recurrent abdominal pain experienced more anxiety and depression than mothers of normal children (OR 6.1; 95%CI 1.8 to 20.8).<sup>24</sup> Our study did not assess the personality type of the subjects's mother. Anxiety and preoccupation of parents to the health, strengthen the child's attention to the symptoms experienced and the child will imitate their parents behavior when experiencing abdominal pain (family modeling).<sup>9</sup>

Diet also affects the occurrence of recurrent abdominal pain. Spicy food, dairy products, foods

that contain lots of fat, and foods that increase the production of gas can cause abdominal pain.<sup>25</sup> However, dietary factors were not assessed in our study as it relates to organic disorders of the gastrointestinal tract.

In the daily practice, physicians can use Rome III questionnaire to diagnose recurrent abdominal pain. However, in addition to using the questionnaire, the doctors must also perform a complete physical examination. Supporting examinations are carried out only if organic pathology is suspected.

In this study, the researchers gave a notice to the school principals and counseling teachers about students who experiencing recurrent abdominal pain. Researchers also gave a notice to the parents of the students and wrote a referral letter to the Gastrohepatology Clinic Department of Pediatrics in Cipto Mangunkusumo Hospital, Jakarta, for the further treatment. Students who experiencing recurrent abdominal pain and had anxious personality types were encouraged to consult with a psychiatrist or psychologist.

This study is the first in Indonesia to evaluate the risk factors that affect the occurrence of recurrent abdominal pain in junior high school students. However, this study has several limitations. Those are: (i) the student classes were chosen not randomly as originally planned because it was based on the class being free from lesson at time of the study; (ii) family history of risk factors for recurrent abdominal pain was only rated at one of the parents, not at all family members; (iii) family history of other gastrointestinal disorders were not assessed, and (iv) personality type of the subjects's parents were not assessed.

Although this study has some limitations, the results are expected to provide an overview of the prevalence and risk factors for recurrent abdominal pain in adolescents with similar characteristics.

In conclusion, the prevalence of recurrent abdominal pain of junior high school students is 17.2%. Anxious personality type, female gender, age > 13 years, and lower-high-family income are the risk factors for recurrent abdominal pain in adolescents. We suggest that in children with recurrent abdominal pains, risk factors should be identified so comprehensive management can be performed. Among related risk factors, anxious personality type is the one which can be given therapy, whereas other risk factors can not be

modified. In children who have anxious personality type, education must be done to the parents about the risk of recurrent abdominal pain and management for the anxiety should be carried out. Future studies about the prevalence and risk factors of RAP need to be done in several places in Indonesia because each region may have different backgrounds and habits.

## Conflict of Interest

None declared.

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