Prevalence and Risk Factors of Dyspepsia in Thai Schoolchildren

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Background and Objective: *Dyspepsia is a common form of chronic abdominal pain in children and adolescents. Although it is usually functional or non-organic in origin, it disturbs daily activities, school attendance and the child's wellbeing. The authors evaluated prevalence and factors associated with dyspepsia among schoolchildren by comparing life-style of dyspeptic children with their asymptomatic peers.*

Material and Method: *Total 1,181 schoolchildren (mean age 14.7 $\pm$ 1.8 years) were recruited from three schools in Bangkok. Data on dyspeptic symptoms were collected by using a questionnaire based on Rome III classification system. Potential precipitating factors for dyspepsia and life-style related to dyspepsia were also explored in the questionnaire.*

Results: *Dyspepsia was reported in 24.0% of the subjects. Prevalence was significantly higher in girls than in boys (27.0% vs. 20.0% p = 0.006). There was no difference between the comparison groups in terms of school test scores, past medical illness, parental marital status, parental income, number of siblings, frequency of stool and spicy food, carbonated beverage or dairy product consumption. The dyspepsia group had higher percentage of family history of peptic ulcer (odds ratio [OR] = 2.5 [95% CI = 1.7 to 3.7]), history of taking medicine (OR 1.7 [1.0 to 2.9]), alcohol consumption (OR 2.4 [1.0 to 5.7]), severe stress (OR = 3.4 [1.2 to 9.9]) and extreme stress (OR = 3.9 [1.3 to 12.0]).*

Conclusion: *Prevalence of self-reported dyspepsia among schoolchildren in this survey was similar to those previously reported; with family history of peptic ulcer, history of taking medicine, alcohol consumption, stresses in life as potential risk factors.*

Keywords: *Dyspepsia, Schoolchildren, Risk factor*

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Chronic abdominal pain or recurrent abdominal pain is a common health problem in children and adolescents. It may derive from organic or functional origins. There are no clear explanations for functional abdominal pain in regard to specific structural, infectious, inflammatory, or biochemical causes. Most recurrent abdominal pain in children between four to sixteen years of age, as classified by Apley and Naish, is believed to be functional[1], although when further investigations are exercised, organic causes can be identified in 5-40% of the cases[2,3]. The condition affects daily activities, child's wellbeing and yields high cost of management despite its non-organic nature[4]. A community-based study demonstrated that 13-17% of middle-school and high-school students have abdominal pain on a weekly basis[5].

According to Rome III criteria, functional dyspepsia is defined as chronic upper abdominal pain or discomfort not relieved by defecation and unexplainable by structural or biochemical abnormalities[6]. Dyspepsia, from both functional and organic causes, is reported 10-25% in community and school-based studies[7,8] but most sufferers do not have serious diseases and their symptoms improve over time[7]. Children with abdominal pain without alarm symptoms or signs of organic disease are likely to have a functional disorder and the additional investigation is not required[3,6]. The pathogenesis of functional dyspepsia is multi-factorial and not well understood. Visceral hypersensitivity, delayed gastric emptying, gastrointestinal dysmotility, altered gut-brain communication and psychological factors have been suggested to play a role in chronic functional dyspepsia. As there are scarce data on the prevalence of this common functional gastrointestinal disorder in Thai

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children, evaluating the prevalence of dyspepsia among Thai schoolchildren in Bangkok was the primary objective of the present study. The other goals were to identify associated factors that might precipitate the abdominal pain and to compare the life-style factors of dyspeptic children with their non-dyspeptic peers.

Material and Method

The protocol of the present study was approved by the Royal Thai Army Medical Department Institutional Review Board (RTA MD IRB). A questionnaire based on Rome III diagnostic questionnaire for pediatric gastrointestinal symptoms was used to assess upper abdominal pain or discomfort. Symptoms of dyspepsia, life style and potential precipitating factors for abdominal pain were also explored. Stress class was also evaluated in the questionnaire using a modified version of Suanprung Stress Test-20 developed by Suanprung Psychiatric Hospital under the Department of Mental Health, Thailand's Ministry of Public Health, with written permission. This test categorizes levels of stress into four severity categories. The questionnaire was validated in twenty patients at the pediatric outpatient clinic, Phramongkutklao Hospital before using, with good accordance of self-reported and physician-interviewed answers. Schoolchildren between twelve to nineteen years of age from three public schools in Bangkok were invited to participate in the present study in a convenience sampling fashion. Subjects and their parents were informed about the objectives of the present study and their written consents were obtained prior to data collection. Participants were then asked to complete by themselves the questionnaire without any assistance of the researchers. Children with a history of hepatobiliary, pancreatic, peptic ulcer diseases and past abdominal surgery were excluded from the analysis.

Statistical analysis

The sample size needed for this survey was 1,470 which yielded a confidence level at 95% with 2% acceptable error and expected 20% dropouts and/or missing data. The results were presented in means, standard deviations and percent. χ^2 test was used to test the differences in proportions of the potential precipitating risk factors for abdominal pain between the groups. Thereafter, logistic regression analysis was used to determine odds ratio (OR) of some risk factors having different proportion between the two groups. 95% confidence intervals (95% CI) and p-value of the OR are also presented. The accepted level of alpha error was ≤ 0.05.

Results

One thousand one hundred and eighty-one of the target schoolchildren (mean age $\pm$ SD = 14.7 $\pm$ 1.8 years) answered the questionnaire. Dyspepsia occurring at least once a week and lasting longer than two months was reported in 283 children (24%). Prevalence was significantly higher in girls than in boys (27% vs. 20%, p = 0.006). The demographic data of the comparison groups are shown in Table 1. Age, levels of education, school test scores, other medical illness, parental age, parental income, number of siblings were not different between the comparison groups. The dyspepsia group tended to have a higher proportion of single parent and female gender but these factors were not significant after multivariate analysis. Family history of peptic ulcer disease was significantly higher in the dyspepsia group (adjusted OR = 2.5; 95% CI = 1.7 to 3.7, p-value < 0.001). Apart from upper abdominal discomfort, most dyspeptic subjects also reported nausea (59% of dyspeptic subjects), bloating (67%), feeling of fullness (82%), nocturnal discomfort (48%), and changes in stool frequency (14.9%).

Comparison groups had no difference in sleeping hours, smoking, frequency of stool, numbers of meal/day, and constant meal time. Diet history other than alcohol consumption (*i.e.* fast food, high fat meal, spicy food, dairy product intake, caffeinated and carbonated beverages and fruit and vegetable consumption) did not correlate with abdominal pain. Potential risk factors for abdominal pain were alcohol consumption (2.4;1.0 to 5.7, p = 0.046), severe stress (3.4; 1.2 to 9.9, p = 0.026) and extreme stress (3.9; 1.3 to 12.0, p = 0.016). Other factors with odds ratios are shown in Table 2.

Discussion

The prevalence of self-reported dyspepsia among children and adolescent in the present study was 24% which is similar to previous studies where the cause of abdominal pain in most cases was functional rather than organic[7,8]. Other published studies demonstrate higher prevalence of chronic abdominal pain in girls than in boys with its peaks at four to six years of age and at early adolescence[9,10]. The present study explored the uninvestigated dyspepsia in middle- and high-school students and found the same female preponderance. Although the prevalence of organic dyspepsia is much lower than functional dyspepsia, the organic disease should be considered in some

Table 1. Demographic characteristics and their proportions in comparison groups (univariate analysis)

	Dyspepsia group	Non-dyspepsia group	p-value
Total (N)	283	898	
Female (n/N, %)	178/283, 62.9	482/898, 53.7	0.006
Age (mean ± SD)	14.8 ± 1.8	14.7 ± 1.8	0.9
School test scores (mean ± SD)	3.12 ± 0.63	3.08 ± 0.63	0.5
Other medical illness (n/N, %)[a]	63/281, 22.4	167/887, 18.8	0.2
History of medication (n/N, %)[a]	33/277, 11.9	56/885, 6.3	0.02
Single parent (n/N, %)[a]	59/281, 21.0	132/889, 14.9	0.015
Parental income > 40,000 baht/mo (n/N, %)[a]	103/278, 37.1	331/864, 38.3	0.7
Family history of peptic ulcer disease (n/N, %)[a]	70/281, 24.9	92/889, 10.4	< 0.001
Fast food consumption[a]			0.14
Frequent[b] (n/N, %)	94/281, 33.5	271/888, 30.5	
Daily (n/N, %)	8/281, 2.9	12/888, 1.4	
Vegetable consumption[a]			0.12
Frequent[b] (n/N, %)	102/280, 36.4	380/880, 43.2	
Daily (n/N, %)	109/280, 38.9	318/880, 36.1	
Fruit consumption[a]			0.4
Frequent[b] (n/N, %)	134/279, 48.0	452/880, 51.4	
Daily (n/N, %)	97/279, 34.8	269/880, 30.6	

[a]Not all participants answered the questions, [b]Defined as more often than two times/week

Table 2. Risk factors of dyspepsia and their proportions and odds ratios in comparison groups

	Dyspepsia group (n/N, %)	Non-dyspepsia group (n/N, %)	Adjusted Odds ratio (95% CI)	p-value
Female	178/283, 62.9	482/898, 53.7	1.3 (0.9 to 1.8)	0.09
History of medication[a]	33/277, 11.9	56/885, 6.3	1.7 (1.0 to 2.9)	0.04
Single parent[a]	59/281, 21.0	132/889, 14.9	1.4 (0.9 to 2.0)	0.1
Family history of PU[a]	70/281, 24.9	92/889, 10.4	2.5 (1.7 to 3.7)	< 0.001
Inappropriate numbers of meal/day[a,b]	104/277, 37.6	247/881, 28.0	1.3 (0.9 to 1.8)	0.14
Inappropriate time of eating[a,c]	107/277, 38.6	255/880, 29.0	1.2 (0.9 to 1.7)	0.28
Smoking[a]	6/275, 2.2	18/874, 2.1	0.8 (0.2 to 2.3)	0.6
Regular spicy food consumption[a,d]	153/282, 54.3	458/889, 51.5	1.0 (0.7 to 1.3)	0.9
Regular alcohol consumption[a,e]	14/886, 5.0	22/886, 2.5	2.4 (1.0 to 5.7)	0.046
Stress[a,f]				
Mild stress	5/280,1.8	42/883, 4.8	1.0	
Moderate stress	63/280, 22.5	325/883,36.8	1.8 (0.6 to 5.4)	0.3
Severe stress	147/280 52.5	405/883, 45.9	3.4 (1.2 to 9.9)	0.026
Extreme stress	65/280, 23.2	111/883, 12.6	3.9 (1.3 to 12.0)	0.016
Stool characteristics[a]				
Soft stool	194/270, 71.9	706/844, 83.7	1.0	
Loose stool	15/270, 5.6	17/844, 2.0	2.5 (1.1 to 5.5)	0.03
Hard stool	61/270, 22.6	121/844, 14.3	1.7 (1.1 to 2.4)	0.01

[a]Not all participants answered the questions, [b]Defined as number of meals not equal to three meals/day, [c]Defined as having time of meals varying from day to day, [d]Defined as eating spicy foods more often than two times/week, [e]Defined as drinking alcohol more often than two times/week, [f]As tested by Modified Suanprung Stress Test-20. PU = peptic ulcer disease

specific cases. The differentiation of organic diseases from functional dyspepsia requires accurate history and physical examination for alarm symptoms or signs. Investigations including blood tests, endoscopy and radiology are required in selected cases[11]. The limitation of the present study, a community-based, was unable to identify organic dyspepsia.

The pathogenesis of functional dyspepsia is multi-factorial. Lifestyle modification, cognitive behavioral therapy, dietary and pharmacological intervention have been tried with varying effectiveness. Daily stressors or stressful life events occurring in families have been reported to be associated with childhood recurrent abdominal pain[12-14] and cognitive behavioral therapy is suggested to be a useful intervention for children with recurrent abdominal pain[15,16]. Until now, the review of the effectiveness of dietary intervention (including fiber supplements, lactose free diets or probiotics supplementation) reveals a lack of high quality evidence[17]. Obesity and low consumption of fruits are reported as significant risk factors for recurrent abdominal pain in schoolchildren[18]. The authors found that only alcohol consumption was a risk factor for dyspepsia. Other diet history (*i.e.* fast food, high fat meal, spicy foods, dairy product intake, caffeinated and carbonated beverages and fruit and vegetable consumption) in dyspeptic participants is not different from the non-dyspepsia group. Theoretically, spicy foods are irritating and can cause abdominal pain. The disagreement of the authors' finding may be explained by inadequate power to detect the difference, inaccuracy of self-reported data, or inter-relation of spicy foods with other, yet perhaps more important, factors which obscures the little, if any, significance it may have. The indifference of other factors in the present study may be explained by the same token.

In the present study, self-reported severe stress and extreme stress were significantly associated with dyspeptic symptoms whereas mild or moderate stress, while could be generally found in schoolchildren, was not associated with abdominal pain. Another factor that the authors found to be associated with dyspepsia was the characteristic of stool. Loose or hard stool was a potential risk factor for abdominal pain as opposed to the frequency of stool, where no association was seen. Changes in form of stools are often found in irritable bowel syndrome in which abdominal pain symptoms can be similar to those of dyspepsia[6]. Due to the limitation of the present study, some participants might have irritable bowel syndrome rather than dyspepsia or they might have both conditions. History of regularly taking medicine also associated with dyspepsia in the authors' survey. Reported drugs included antacid, paracetamol, vitamin, anti-histamine and anti-allergic. NSAIDS use, believed to cause dyspepsia, was not reported in the present study. The reason for taking antacid or analgesic might be related to having abdominal pain in the dyspepsia group in the first place. On the other hand, some of these medicines might cause gastrointestinal symptoms by themselves.

Another survey in Norway reports the tendency of recurrent abdominal pain in low-income and low-educated families[19] but there was no difference in socioeconomic status in the present study. Nevertheless, family history of peptic ulcer disease was strongly associated with dyspeptic symptom in the authors' survey. Although this might be overestimated, *Helicobacter pylori* infection may also play a role as there are data suggesting significant family history of peptic ulcer disease in children infected with *H. pylori*[20]. In such cases, esophago-gastro-duodenoscopy should be done.

Discrepancies of such findings among studies may be largely due to the multi-factorial nature of dyspepsia. Those factors in focus are somewhat related to one another and may depend on genetic, environmental, cultural, or societal context. A very large study with a very large sample size from every part of the country may better denote the most contributing factors of which knowledge will help in understanding the pathogenesis of dyspepsia and hopefully will lead to better care of dyspeptic children.

In conclusion, dyspepsia was common in Thai schoolchildren with the self-reported prevalence of 24%, according to the authors' survey. Family history of peptic ulcer, history of taking medicine, alcohol consumption, stresses in life were the potential precipitating factors.

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Potential conflicts of interest

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ความชุกและปัจจัยที่เกี่ยวข้องของการปวดท้องแบบ dyspepsia ในเด็กนักเรียนมัธยมศึกษาในกรุงเทพมหานคร

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Dyspepsia เป็นอาการปวดท้องเรื้อรังที่พบบ่อยในเด็กและวัยรุ่น โดยมักไม่พบสาเหตุทางกาย แต่รบกวนชีวิตประจำวัน และกิจกรรมต่างๆ ของผู้ป่วยอย่างมาก จึงต้องการศึกษาความชุกและปัจจัยที่เกี่ยวข้องกับ dyspepsia ในเด็กนักเรียนโดยเปรียบเทียบลักษณะการดำเนินชีวิตของผู้ป่วยกับกลุ่มเปรียบเทียบ

***วัสดุและวิธีการ**: ผู้นิพนธ์เก็บข้อมูลเด็กนักเรียนอายุเฉลี่ย 14.7 $\pm$ 1.8 ปี จากโรงเรียน 3 แห่ง ในกรุงเทพมหานคร จำนวน 1,181 คน โดยให้กลุ่มตัวอย่างตอบแบบสอบถามซึ่งยึดแนวทางตามเกณฑ์ของ Rome III แบบสอบถามนี้ถามเกี่ยวกับปัจจัยที่น่าจะส่งเสริมอาการปวดท้องและแนวทางการดำเนินชีวิตประจำวันที่เกี่ยวข้องกับอาการปวดท้องของผู้ป่วย*

***ผลการศึกษา**: ความชุกของอาการปวดท้องในการสำรวจนี้คือ ร้อยละ 24 โดยมีความชุกในเด็กผู้หญิงสูงกว่าในเด็กผู้ชาย (ร้อยละ 27 เทียบกับร้อยละ 20, p = 0.006) ไม่พบความแตกต่างระหว่างกลุ่มในด้านผลการเรียน ประวัติการเจ็บป่วยในอดีต สถานภาพสมรสของบิดามารดา รายได้ของครอบครัว จำนวนพี่น้อง จำนวนครั้งของการถ่ายอุจจาระและลักษณะของอาหารที่รับประทานได้แก่ อาหารรสจัด น้ำอัดลม ผลิตภัณฑ์จากนมวัว แต่กลุ่มผู้ป่วยมีประวัติโรคแผลกระเพาะอาหารในครอบครัว (OR 2.5, 95% CI = 1.7-3.7) ประวัติการใช้ยา (OR 1.7 [1.0-2.9]) การดื่มแอลกอฮอล์ (OR 2.4 [1.0 to 5.7]) ความเครียดมาก (OR 3.4 [1.2-9.9]) ความเครียดรุนแรง (OR 3.9 [1.3 to 12.0]) มากกว่ากลุ่มเปรียบเทียบ*

***สรุป**: ความชุกของ dyspepsia จากการตอบแบบสอบถามด้วยตนเองของเด็กนักเรียนไทยในการสำรวจครั้งนี้คล้ายกับการศึกษาในอดีต โดยมีประวัติโรคกระเพาะอาหารในครอบครัว ประวัติการใช้ยา การดื่มแอลกอฮอล์ ความเครียดในชีวิต เป็นปัจจัยเสี่ยงที่เกี่ยวข้องกับอาการปวดท้อง*