

Association Between Functional Gastrointestinal Diseases and Exposure to Abuse in Teenagers

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Summary

Abdominal pain-predominant functional gastrointestinal diseases (AP-FGD) are common in children and commonly attributed to exposure to child abuse. However, this relationship has not been studied in teenagers, and the main objective of the current study was to assess it.

Teenagers were recruited from four randomly selected schools in Western province of Sri Lanka. Data were collected using a validated self-administered questionnaire. AP-FGD were diagnosed using Rome III criteria.

A total of 1850 teenagers aged 13–18 years were included. Three hundred and five (16.5%) had AP-FGD. AP-FGD were significantly higher in those exposed to sexual (34.0%), emotional (25.0%) and physical (20.2%) abuse, than in those not abused (13.0%, $p < 0.001$). Those with AP-FGD exposed to abuse had a higher severity score for bowel symptoms (30.8% vs. 24.7% in not abused, $p < 0.05$).

This study highlights the importance of identifying exposure to abuse in management of teenagers with AP-FGD.

Key words: abdominal pain, abuse, child, functional gastrointestinal disorder, somatization.

Introduction

As in many societies around the world, a significant percentage of Sri Lankan children are exposed to many forms of physical, emotional and sexual abuse [1]. However, most of these incidents are not reported to the authorities, and reported cases constitute only the tip of the iceberg. Exposure to abuse during childhood is associated with presence of various somatic symptoms in adulthood including abdominal pain [2–5].

Chronic abdominal pain is a common symptom seen in children. The majority of affected children have no underlying organic pathology to explain their symptoms and fulfil the Rome III criteria

for functional gastrointestinal diseases [6, 7]. Community-based studies have shown that abdominal pain-predominant functional gastrointestinal diseases (AP-FGD) are a significant health problem and seen in ~12% of school children in Sri Lanka. The commonest AP-FGD reported in Sri Lanka is irritable bowel syndrome (IBS). According to previous studies, prevalence of IBS in school children in the United States is ~10.5% [8]. Similarly, a school-based study from Italy in children aged 6–19 years using Rome II criteria has reported ulcer-like dyspepsia in 3.4% and dysmotility-like dyspepsia in 3.7% [9].

Numerous studies in adults have assessed the association between child abuse and AP-FGD [10–12]. Most of these studies have been conducted in adult females who have been exposed to sexual abuse during childhood [2, 3, 10, 11, 13, 14]. Furthermore, the majority of studies evaluated the association between sexual abuse and IBS [10, 11, 15–17]. Therefore, the impact of child abuse on development of some AP-FGD, which are not

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commonly seen in adults such as functional abdominal pain and abdominal migraine, is not known.

Only a handful of studies so far have evaluated the impact of abuse on gastrointestinal symptoms during childhood [18–22]. However, there is no detailed account of the association between exposure to different forms of child abuse and different types of AP-FGD in teenagers. Lack of well-designed studies to assess this association has been highlighted in a recent systematic review conducted by Sonneveld *et al.* [23].

The current study aims to fill some of these gaps of knowledge on association between AP-FGD and exposure to child abuse. The objectives of this study were to evaluate (i) the relationship between exposure to child abuse and presence of AP-FGD in teenagers; (ii) severity of symptoms of AP-FGD in children exposed to abuse; and (iii) somatic symptoms of teenagers with AP-FGD according to exposure to abuse.

Methods

This cross-sectional study was conducted in children aged 13–18 years in Western province of Sri Lanka. For this study, four mixed schools (with both girls and boys) were randomly selected from 427 schools in this province with students in this age group. Schools were randomly selected from the list of schools available in the provincial education office using lots. From each school, all classes of academic years (grades) 8–13 were selected. Children in these classes were within the age limits of 13 to 18 years. All children who were present on the day of the survey were invited to take part in the study.

Permission to conduct the study was obtained from school administration. Written informed consent was obtained from parents, and assent was given by participants themselves.

Information regarding gastrointestinal symptoms and child abuse were collected using a self-administered questionnaire. This was an anonymous questionnaire. The questionnaire was in native language (Sinhala) and has been pretested for Sri Lankan children of this age group. It was administered in examination setting to ensure confidentiality and privacy. The questionnaire was filled under the guidance of research assistants and collected on the same day.

The questionnaire consisted of four parts. Part 1 consisted of questions of socio-demographic and family characteristics. Part 2 contained the Rome III questionnaire for paediatric functional gastrointestinal diseases (self-report form for children >10 years) [24] and a symptom severity scale. Rome III questionnaire for paediatric functional gastrointestinal diseases has been previously translated into native language (Sinhala), pretested and used in several Sri Lankan studies involving children of same age group [25, 26]. Part 3 contained information on exposure to child abuse and adverse life events. The

child abuse questionnaire has been already validated and used in a previous Sri Lankan study [27]. It has questions to identify all three major forms of child maltreatment (physical, sexual and emotional abuse). Part 4 was child somatization inventory [28]. This was designed to assess somatic symptoms and their severity irrespective of their aetiology. It has been translated and pretested for Sri Lankan children by the investigators before used in this study.

Scales used

Child somatization inventory consists of 24 items. Each item has scores 0 to 4 (0 = *never a problem*; 4 = *almost always a problem*). Total somatization score was obtained by adding up scores obtained for all 24 items [28].

Severity of abdominal pain, dyspepsia and bowel symptoms were assessed using a 100 mm visual analogue scale where 0% was not having symptoms at all and 100% was having very severe symptoms.

Definitions used

There are four types of AP-FGD (IBS, functional dyspepsia, abdominal migraine and functional abdominal pain). The current standard practice of diagnosing them is using symptom-based criteria. We used Rome III criteria defined by Rasquin *et al.* [29] in 2006, which is the gold standard for positive diagnosis of functional gastrointestinal diseases in children and adolescents. IBS subtyping was done using criteria described by Longstreth *et al.* [30].

Ethical approval

The study was approved by the Ethical Review Committee of the Sri Lanka College of Paediatricians.

Statistical analysis

The data were analysed using EpiInfo (EpiInfo 6, version 6.04 (1996), Centres of Disease Control and Prevention, Atlanta, Georgia, USA and World Health Organization, Geneva, Switzerland). Somatization scores were compared using unpaired *t*-test. Association between child abuse and AP-FGD was assessed using X^2 test. $P < 0.05$ was considered as significant.

Results

A total of 1855 questionnaires were distributed, and all of them were returned. Of them, 1850 (99.7%) properly filled questionnaires were included in the analysis.

Prevalence of AP-FGD

There were 1000 (54.1%) boys (mean age 14.4 years, SD 1.3 years). A total of 305 (16.5%) children had AP-FGD. Table 1 demonstrates the prevalence of

TABLE 1
Prevalence of abdominal pain-predominant functional gastrointestinal disorders according to sex

Type of FGD	Boys n (%)	Girls n (%)	Total n (%)
IBS–Total	42 (4.2)	49 (5.8)	91 (4.9)
IBS-diarrhoea predominant	16 (1.6)	17 (2.0)	33 (1.8)
IBS-constipation predominant	10 (1.0)	20 (2.4)	30 (1.6)
IBS-mixed	7 (0.7)	6 (0.7)	13 (0.7)
IBS-untyped	9 (0.9)	6 (0.7)	15 (0.8)
Functional dyspepsia	6 (0.6)	5 (0.9)	11 (0.6)
Abdominal migraine	8 (2.7)	29** (2.5)	37 (1.9)
Functional abdominal pain	76 (7.6)	104* (12.2)	180 (9.7)
Abdominal pain-predominant FGD-total	130 (13.0)	175** (20.1)	305 (16.5)

FGD, functional gastrointestinal disease.

* $p=0.001$, ** $p<0.0001$, chi-square test, girls vs. boys.

TABLE 2
Prevalence of abdominal pain-predominant functional gastrointestinal disorders according to child abuse

Type of FGD	Physical abuse		Emotional abuse		Sexual abuse		Any type of abuse	
	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)
IBS	36 (7.7)*	55 (4.0)	37 (8.5)*	54 (3.8)	10 (18.9)*	81 (4.6)	59 (8.5)*	32 (2.8)
FD	5 (1.1)	6 (0.4)	3 (0.7)	8 (0.6)	0	11 (0.6)	6 (0.9)	5 (0.4)
AM	10 (2.1)	27 (1.9)	16 (3.7)*	21 (1.5)	2 (3.8)	35 (2.0)	18 (2.6)*	19 (1.6)
FAP	49 (10.4)	131 (9.5)	61 (14.0)*	119 (8.4)	8 (15.1)	172 (9.7)	82 (11.8)*	98 (8.5)
AP-FGD total	95 (20.2)*	210 (15.1)	109 (25.0)*	196 (13.8)	18 (34.0)*	287 (16.2)	155 (22.4)*	150 (13.0)

IBS, irritable bowel syndrome; FD, functional dyspepsia; AM, abdominal migraine; FAP, functional abdominal pain; AP-FGD, abdominal pain-predominant functional gastrointestinal diseases.

* $p<0.05$ compared with not abused, chi-square test.

different AP-FGD types according to gender. Commonest AP-FGD type observed in our cohort was functional abdominal pain. AP-FGD was significantly more prevalent in girls than in boys.

Association between child abuse and AP-FGD

The association between AP-FGD types and physical, sexual and emotional abuse is shown in Table 2. Figure 1 shows the prevalence of AP-FGD according to age and exposure to abuse. The prevalence of AP-FGD was significantly higher in children exposed to child abuse.

Symptom severity

The mean scores obtained for severity of abdominal pain, dyspepsia and bowel symptoms in children with AP-FGD are demonstrated in Figure 2 according to child abuse. The scores obtained for severity of bowel symptoms were significantly higher in children with AP-FGD who have been exposed to abuse.

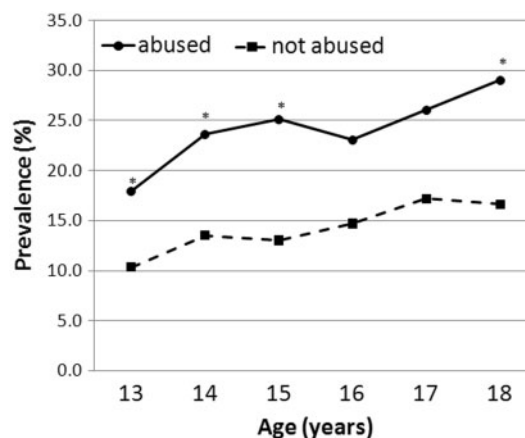


FIG. 1. Prevalence of abdominal pain-predominant functional gastrointestinal diseases according to exposure to abuse. * $p<0.05$, Z-test.

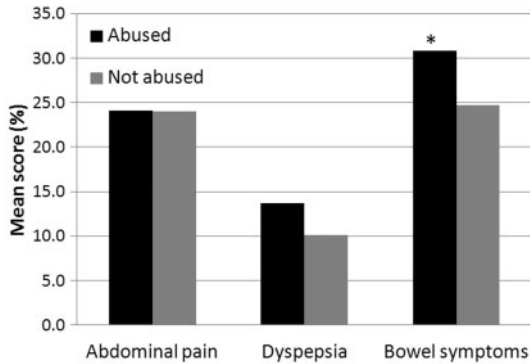


FIG. 2. Scores obtained for severity of symptoms in children with abdominal pain-predominant functional gastrointestinal diseases according to exposure to abuse. * $p < 0.05$, unpaired t -test.

Somatization index in children with AP-FGD

Table 3 shows the mean somatization scores in children with AP-FGD and controls. Overall somatization score and mean scores obtained for individual somatic symptoms were significantly higher in children with AP-FGD compared to controls, except that for losing voice.

Children with AP-FGD who have been exposed to child abuse had a significantly higher overall somatization score (mean 17.6, SD 11.5) than those not exposed to abuse (mean 12.8, SD 10.0, $p < 0.0001$).

Discussion

In this study conducted in the Western province of Sri Lanka, we found AP-FGD in 16.5% of 13–18-year-olds. Girls were more affected than boys. The commonest AP-FGD seen in our teenagers was functional abdominal pain, closely followed by IBS. The prevalence of AP-FGD was significantly higher in those exposed to physical, sexual and emotional abuse. In teenagers with AP-FGD, those exposed to child abuse had a significantly higher severity of bowel symptoms and higher somatization score.

In our study, the prevalence of AP-FGD was higher in children exposed to all three main types of abuse (physical, emotional and sexual abuse). This observation was noted across all age groups we have assessed. Very few researchers have studied the relationship between child abuse gastrointestinal symptoms during childhood, especially among teenagers. None of those previous paediatric studies have assessed the association between exposure to abuse and abdominal pain-related FGD and impact of abuse on symptom profile in details. van Tilburg and co workers [18] have reported an association between child abuse and presence of abdominal pain, nausea and vomiting at the age of 12 years.

Two other studies evaluating stressful life events in recurrent abdominal pain have reported exposure to sexual abuse in several study subjects [21]. Similarly, Mellon and colleagues [19] reported a significantly higher prevalence of faecal incontinence in children exposed to abuse. In contrast to this, Tam et al. [20] failed to find an association between constipation and abuse. The relationship between child abuse and the four main types of AP-FGD has not been studied in teenagers. Our findings are also similar to that previously reported in adult studies where IBS was noted to be more prevalent among adults who experienced abuse as a child [3, 12, 16, 17].

One previous study, conducted in 10 adult females with IBS has shown greater pain in those exposed to abuse [31]. Similarly, another adult study conducted in females attending a gastroenterology clinic has shown a significant association between greater pain severity and exposure to abuse [3]. When the relationship between exposure to abuse and symptom severity was assessed in the current study, the scores obtained for severity of bowel symptoms were significantly higher in children with AP-FGD who have been exposed to child abuse, than those not exposed to such events. However, severity of abdominal pain and dyspepsia had no such relationship. The exact reason for this lack of relationship is not clear.

A previous school-based study in children aged 10–16 years, using Rome III criteria, has reported AP-FGD in 12.5% of affected children [26], and the prevalence AP-FGD in the current study is higher than that reported earlier. In addition, we have also shown that the prevalence of AP-FGD has an positive relationship with age. Inclusion of older children may have contributed to the higher prevalence we observed in the current study. In the previous study, the commonest AP-FGD reported was IBS, while in the current study the most prevalent AP-FGD was functional abdominal pain. The exact reasons for these differences are unclear. A previous study was conducted in three provinces in the country, while the current study is conducted in only one province. In addition, the age difference in recruited children might have contributed to this difference. However, similar to the current study, a laboratory-based study conducted in the same area has found functional abdominal pain as the commonest cause for abdominal pain in children aged 5–15 years [6]. The previous studies have also reported a female preponderance [25, 26].

In this study, we have assessed the somatization score in children with AP-FGD. Scores obtained for all somatic symptoms were significantly higher in those with AP-FGD than in controls, except for losing voice. Extra-intestinal somatic symptoms were also common in our children with AP-FGD. Headache, back pain and limb pain were the most common somatic symptoms observed in our teenagers with AP-FGD apart from abdominal pain.

TABLE 3
Somatization scores for children with abdominal pain-predominant functional gastrointestinal disorders

Somatic symptom	IBS	Functional dyspepsia	Abdominal migraine	Functional abdominal pain	Abdominal pain-predominant FGD total	Controls
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Headache	1.7 (1.1)*	1.3 (1.1)	2.0 (1.0)*	1.6 (1.0)*	1.7 (1.0)*	1.2 (1.0)
Faintness or dizziness	0.8 (1.0)*	0.6 (0.8)	1.0 (1.1)*	0.5 (0.8)*	0.6 (0.9)*	0.3 (0.7)
Pain—heart or chest	0.9 (0.9)*	1.3 (1.4)*	1.1 (1.1)*	0.6 (0.9)*	0.8 (1.0)*	0.4 (0.8)
Low energy, slowed down	0.9 (1.0)*	0.6 (0.5)	1.1 (1.2)*	0.7 (0.9)*	0.8 (1.0)*	0.5 (0.9)
Pain—lower back	1.1 (1.2)*	0.5 (0.7)	1.5 (1.4)*	0.8 (1.2)*	1.0 (1.2)*	0.5 (0.9)
Sore muscles	0.7 (0.9)*	0.3 (0.6)	1.3 (1.2)*	0.6 (0.9)*	0.7 (0.9)*	0.4 (0.8)
Trouble getting breath	0.5 (0.9)*	0.4 (0.7)	0.7 (1.1)*	0.5 (0.9)*	0.5 (0.9)*	0.3 (0.7)
Hot or cold spells	1.0 (1.1)*	0.4 (0.7)	1.2 (1.3)*	0.5 (0.8)	0.6 (0.9)*	0.4 (0.8)
Numbness or tingling	1.0 (1.0)*	0.2 (0.4)	1.0 (1.1)*	0.6 (0.9)*	0.7 (1.0)*	0.5 (0.8)
Weakness	1.0 (1.1)*	0.7 (1.2)	1.1 (1.1)*	0.7 (0.9)*	0.8 (0.9)*	0.5 (0.8)
Heavy feeling in arms, legs	0.6 (1.0)*	0.2 (0.6)	0.8 (1.1)*	0.3 (0.7)	0.4 (0.8)*	0.2 (0.5)
Nausea, upset stomach	1.1 (1.0)*	0.5 (0.5)	1.5 (1.3)*	0.5 (0.8)*	0.7 (0.9)*	0.3 (0.6)
Constipation	0.7 (1.0)*	0.3 (0.5)	0.8 (1.1)*	0.2 (0.6)	0.4 (0.8)*	0.2 (0.5)
Loose bowel movements, diarrhoea	0.5 (0.9)*	0.2 (0.4)	0.7 (1.2)*	0.2 (0.5)	0.3 (0.7)*	0.2 (0.5)
Pain—stomach	1.7 (1.3)*	1.0 (1.0)	2.3 (1.4)*	1.3 (1.0)*	1.4 (1.1)*	0.6 (0.8)
Heart beating too fast	0.5 (0.8)*	0.0	0.8 (1.2)*	0.5 (0.9)*	0.5 (0.9)*	0.3 (0.7)
Difficulty in swallowing	0.5 (0.9)*	0.1 (0.3)	0.3 (0.5)	0.2 (0.5)	0.3 (0.7)*	0.2 (0.5)
Losing voice	0.3 (0.7)*	0.0	0.3 (0.5)	0.2 (0.6)	0.2 (0.6)	0.2 (0.6)
Blurred vision	0.7 (1.1)*	0.5 (0.7)	1.0 (1.2)*	0.4 (0.7)	0.5 (0.9)*	0.3 (0.7)
Vomiting, throwing up	0.4 (0.8)*	0.4 (0.5)	0.6 (0.9)*	0.3 (0.6)*	0.3 (0.7)*	0.2 (0.5)
Feeling bloated, gassy	0.6 (1.0)*	0.5 (0.7)	0.5 (0.9)*	0.5 (0.8)*	0.5 (0.9)*	0.2 (0.6)
Food makes you sick	0.3 (0.8)*	0.2 (0.4)	0.6 (1.1)*	0.1 (0.5)	0.2 (0.7)*	0.1 (0.4)
Pain—Knees, elbows, joints	0.6 (1.0)*	0.2 (0.6)	0.8 (1.1)*	0.4 (0.7)	0.5 (0.8)*	0.3 (0.7)
Pain—arms, legs	1.1 (1.1)*	0.4 (0.7)	1.4 (1.4)*	0.7 (0.9)	0.9 (1.0)*	0.5 (0.9)
Total somatization score	18.9 (11.6)*	10.2 (5.5)	24.2 (13.6)*	12.8 (9.8)*	15.2 (11.1)*	8.4 (8.8)

FGD, functional gastrointestinal diseases.

* $p < 0.05$, compared to controls, unpaired t -test.

A previous Sri Lankan study conducted in children aged 10–16 years has also reported a higher prevalence of some intestinal and extra-intestinal symptoms in children with AP-FGD [26]. However, the previous study has only assessed few somatic symptoms and has not used the complete somatization index. Therefore, a detailed evaluation of somatic symptoms had not been done in teenagers with AP-FGD previously for us to make a comparison. This novel observation indicates a number of somatic symptoms are contributing to the suffering of children with AP-FGD. Therefore, inquiring about presence of somatic symptoms needs to be an integral part of clinical evaluation of children with abdominal pain.

Furthermore, total somatization score was significantly higher in children exposed to abuse than those not exposed to such events. Previous studies have also reported higher prevalence of somatic symptoms among adults exposed to abuse [2, 4, 5, 13]. However, there were no previous studies to evaluate this relationship in details in paediatric age group.

Exact pathophysiological mechanism explaining the association between exposure to abuse and presence of gastrointestinal symptoms is not clear. However, several possible underlying mechanisms have been postulated to explain gastrointestinal symptoms in those exposed to abuse. Functional gastrointestinal disorders including AP-FGD are considered as disorders of dysregulation of the brain–gut communication system or the brain–gut axis [32]. Adverse and traumatic life events such as exposure to abuse are believed to modify the brain–gut axis both at central and peripheral levels. Possible mediating mechanisms suggested are increased autonomic nervous system reactivity to stressors, visceral hypersensitivity and lower sensation threshold in the gut, altered cortico-limbic pain modulatory systems linking hypervigilance and emotions and increased repose of the hypothalamic–pituitary–adrenal axis to stress [10].

In this study, we have recruited teenagers aged 13–18 years. This is a crucial time period of life of any human being in terms of physical, social and

emotional development and education. Presence of a chronic painful disease condition, such as AP-FGD, during this period, in addition to social and psychological after-effects of child abuse, would significantly impede their development and education and will have a significant negative impact on their future social, emotional and financial stability. In this context, detection of AP-FGD and child abuse and active intervention to minimize detrimental effects of them during early teenage period is of utmost importance to prevent long-term consequences of these conditions.

There were two main limitations in this study. In this questionnaire-based school survey, we did not investigate children to exclude organic causes for abdominal pain. In a previous study, we identified organic diseases in 10.9% of children with recurrent abdominal and nearly 89% had functional gastrointestinal diseases [6]. Similar results have been reported from other countries as well [22, 33, 34]. The organic diseases observed in the previous study include urinary tract infection, gastroesophageal reflux disease, urinary calculi, antral gastritis and intestinal amoebiasis [6]. Parasitic infestations such as giardiasis and amoebiasis have been considered to be possible mimickers of FGD; however, in that study, prevalence of these diseases was 1.8%, similar to several previous studies conducted in Sri Lanka [35]. The second limitation of the study is that, because this is self-administered questionnaire, there is recall bias. Those exposed to abuse are reluctant to admit it. Number of reported cases of abuse is only a small percentage of actual events. Taking extensive measures to ensure confidentiality and privacy in the current study may have increased the reported incidences.

In conclusion, we found a higher prevalence of AP-FGD in teenagers who have been exposed to physical, sexual and emotional abuse. Those with AP-FGD had other gastrointestinal-related and extra-gastrointestinal somatic symptoms and higher somatization index than controls. In addition, scores obtained for severity of bowel symptoms were significantly higher in teenagers with AP-FGD exposed to abuse than those not exposed to such events.

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