Epidemiological and pathophysiological aspects of abdominal pain predominant functional gastrointestinal disorders in children and adolescents: a Sri Lankan perspective
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Chapter 6

Association between functional gastrointestinal disorders and exposure to
abuse in teenagers

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SUMMARY

Abdominal pain predominant functional gastrointestinal disorders (AP-FGIDs) are common
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 is 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-FGIDs 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-FGIDs. AP-FGIDs 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-FGIDs 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-FGIDs.
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. However, most of these incidences are not reported to the authorities and reported cases constituted of only the tip of the iceberg. Exposure to abuse during childhood is associated with presence of various somatic symptoms in adulthood including abdominal pain.

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 disorders. Community based studies have shown that abdominal pain-predominant functional gastrointestinal disorders (AP-FGIDs) are a significant health problem and seen in ~12% of school children in Sri Lanka. The commonest AP-FGID reported in Sri Lanka is irritable bowel syndrome (IBS). According to previous studies, prevalence of IBS in school children in USA is ~10.5%. Similarly, a school based study from Italy in children 6-19 years using Rome II criteria has reported ulcer-like dyspepsia in 3.4% and dysmotility-like dyspepsia 3.7%.

Numerous studies in adults have assessed the association between child abuse and AP-FGIDs. Most of these studies have been conducted in adult females who have been exposed to sexual abuse during childhood. Furthermore, the majority of studies evaluated the association between sexual abuse and irritable bowel syndrome. Therefore, the impact of child abuse on development of some AP-FGIDs which are not 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. However, there is no detailed account of the association between exposure to different forms of child abuse and different types of AP-FGIDs in teenagers. Lack of well-designed studies to assess this association has been highlighted in a recent systematic review conducted by Sonneveld et al.

The current study aims to fill some of these gaps of knowledge on association between AP-FGIDs 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-FGIDs in teenagers; (ii) severity of symptoms of AP-FGIDs in children exposed to abuse and; (iii) somatic symptoms of teenagers with AP-FGIDs 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 ascent 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 pediatric functional gastrointestinal disorders (self-report form for children > 10 years)\textsuperscript{24} and a symptom severity scale. Rome III questionnaire for pediatric functional gastrointestinal disorders has been previously translated into native language (Sinhala), pretested and used in several Sri Lankan studies involving children of same age group.\textsuperscript{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.\textsuperscript{27} It has questions to identify all three major forms of child maltreatment (physical, sexual and emotional abuse). Part 4 was child somatization inventory.\textsuperscript{28} This was designed to assess somatic symptoms and their severity irrespective of their etiology. 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.\textsuperscript{28}
Severity of abdominal pain, dyspepsia and bowel symptoms were assessed using a 100mm 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-FGIDs (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. in 2006 which is the gold standard for positive diagnosis of FGIDs in children and adolescents. IBS subtyping was done using criteria described by Longstreth et al.

**Ethical approval**
The study was approved by the Ethical Review Committee of the Sri Lanka College of Pediatricians.

**Statistical analysis**
The data were analyzed 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-FGIDs 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-FGIDs**
There were 1000 (54.1%) males [mean age 14.4 years, SD 1.3 years]. A total of 305 (16.5%) of children had AP-FGIDs. Table 6.1 demonstrates the prevalence of different AP-FGIDs types according to gender. Commonest AP-FGID observed in our cohort is functional abdominal pain. AP-FGIDs was significantly more prevalent in girls than in boys.

**Association between child abuse and AP-FGIDs**
The association between AP-FGID types and physical, sexual and emotional abuse is shown in Table 6.2. Figure 6.1 shows the prevalence of AP-FGIDs according to age and exposure to abuse. The prevalence of AP-FGIDs was significantly higher in children exposed to child abuse.
The mean scores obtained for severity of abdominal pain, dyspepsia and bowel symptoms in children with AP-FGIDs are demonstrated in Figure 6.2 according to child abuse. The scores obtained for severity of bowel symptoms were significantly higher in children with AP-FGIDs, who have been exposed to abuse.

**Symptom severity**

**Somatization index in children with AP-FGIDs**

Table 6.3 shows the mean somatization scores in children with AP-FGIDs and controls. Overall somatization score and mean scores obtained for individual somatic symptoms were significantly higher in children with AP-FGIDs compared to controls, except that for losing voice.

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

In our study, the prevalence of AP-FGIDs 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 pediatric studies have assessed the association between exposure to abuse and AP-FGIDs and impact of abuse on symptom profile in details. van Tilburg and coworkers 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. Similarly,
### Table 6.1 – Prevalence of abdominal pain-predominant functional gastrointestinal disorders according to sex

<table>
<thead>
<tr>
<th>Type of FGID</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>N</em></td>
<td>(%)</td>
<td><em>N</em></td>
</tr>
<tr>
<td>IBS – Total</td>
<td>42</td>
<td>4.2%</td>
<td>49</td>
</tr>
<tr>
<td>IBS-diarrhea predominant</td>
<td>16</td>
<td>1.6%</td>
<td>17</td>
</tr>
<tr>
<td>IBS-constipation predominant</td>
<td>10</td>
<td>1.0%</td>
<td>20</td>
</tr>
<tr>
<td>IBS-mixed</td>
<td>7</td>
<td>0.7%</td>
<td>6</td>
</tr>
<tr>
<td>IBS-untyped</td>
<td>9</td>
<td>0.9%</td>
<td>6</td>
</tr>
<tr>
<td>Functional dyspepsia</td>
<td>6</td>
<td>0.6%</td>
<td>5</td>
</tr>
<tr>
<td>Abdominal migraine</td>
<td>8</td>
<td>2.7%</td>
<td>29**</td>
</tr>
<tr>
<td>Functional abdominal pain</td>
<td>76</td>
<td>7.6%</td>
<td>104*</td>
</tr>
<tr>
<td>Abdominal pain predominant FGIDs-total</td>
<td>130</td>
<td>13.0%</td>
<td>175**</td>
</tr>
</tbody>
</table>

FGID, functional gastrointestinal disorder

*p=0.001, **p<0.0001, chi-square test, girls vs. boys
Table 6.2 – Prevalence of abdominal pain-predominant functional gastrointestinal disorders according to child abuse

<table>
<thead>
<tr>
<th></th>
<th>Physical abuse</th>
<th></th>
<th>Emotinal abuse</th>
<th></th>
<th>Sexual abuse</th>
<th></th>
<th>Any type of abuse</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>IBS</td>
<td>36 (7.7%)*</td>
<td>55 (4.0%)</td>
<td>37 (8.5%)*</td>
<td>54 (3.8%)</td>
<td>10 (18.9%)*</td>
<td>81 (4.6%)</td>
<td>59 (8.5%)*</td>
</tr>
<tr>
<td>FD</td>
<td>5 (1.1%)</td>
<td>6 (0.4%)</td>
<td>3 (0.7%)</td>
<td>8 (0.6%)</td>
<td>0</td>
<td>11 (0.6%)</td>
<td>6 (0.9%)</td>
</tr>
<tr>
<td>AM</td>
<td>10 (2.1%)</td>
<td>27 (1.9%)</td>
<td>16 (3.7%)*</td>
<td>21 (1.5%)</td>
<td>2 (3.8%)</td>
<td>35 (2.0%)</td>
<td>18 (2.6%)*</td>
</tr>
<tr>
<td>FAP</td>
<td>49 (10.4%)</td>
<td>131 (9.5%)</td>
<td>61 (14.0%)*</td>
<td>119 (8.4%)</td>
<td>8 (15.1%)</td>
<td>172 (9.7%)</td>
<td>82 (11.8%)*</td>
</tr>
<tr>
<td>AP-FGIDs total</td>
<td>95 (20.2%)*</td>
<td>210 (15.1%)</td>
<td>109 (25.0%)*</td>
<td>196 (13.8%)</td>
<td>18 (34.0%)*</td>
<td>287 (16.2%)</td>
<td>155 (22.4%)*</td>
</tr>
</tbody>
</table>

IBS = irritable bowel syndrome, FD = functional dyspepsia, AM = Abdominal migraine, FAP = functional abdominal pain, AP-FGID = abdominal pain predominant functional gastrointestinal disorders

*p<0.05 compared to not abuses, unpaired t-test
### Table 6.3 – Somatization scores for children with abdominal pain-predominant functional gastrointestinal disorders

<table>
<thead>
<tr>
<th>Somatic symptom</th>
<th>IBS Mean (SD)</th>
<th>Functional dyspepsia Mean (SD)</th>
<th>Abdominal migraine Mean (SD)</th>
<th>Functional abdominal pain Mean (SD)</th>
<th>AP-FGIDs total Mean (SD)</th>
<th>Controls Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>1.7 (1.1)*</td>
<td>1.3 (1.1)</td>
<td>2.0 (1.0)*</td>
<td>1.6 (1.0)*</td>
<td>1.7 (1.0)*</td>
<td>1.2 (1.0)</td>
</tr>
<tr>
<td>Faintness or dizziness</td>
<td>0.8 (1.0)*</td>
<td>0.6 (0.8)</td>
<td>1.0 (1.1)</td>
<td>0.5 (0.8)*</td>
<td>0.6 (0.9)*</td>
<td>0.3 (0.7)</td>
</tr>
<tr>
<td>Pain – heart of chest</td>
<td>0.9 (0.9)*</td>
<td>1.3 (1.4)*</td>
<td>1.1 (1.1)</td>
<td>0.6 (0.9)*</td>
<td>0.8 (1.0)*</td>
<td>0.4 (0.8)</td>
</tr>
<tr>
<td>Low energy, slowed down</td>
<td>0.9 (1.0)*</td>
<td>0.6 (0.5)</td>
<td>1.1 (1.2)</td>
<td>0.7 (0.9)*</td>
<td>0.8 (1.0)</td>
<td>0.5 (0.9)</td>
</tr>
<tr>
<td>Pain – lower back</td>
<td>1.1 (1.2)*</td>
<td>0.5 (0.7)</td>
<td>1.5 (1.4)*</td>
<td>0.8 (1.2)*</td>
<td>1.0 (1.2)</td>
<td>0.5 (0.9)</td>
</tr>
<tr>
<td>Sore muscles</td>
<td>0.7 (0.9)*</td>
<td>0.3 (0.6)</td>
<td>1.3 (1.2)</td>
<td>0.6 (0.9)</td>
<td>0.7 (0.9)</td>
<td>0.4 (0.8)</td>
</tr>
<tr>
<td>Trouble getting breath</td>
<td>0.5 (0.9)*</td>
<td>0.4 (0.7)</td>
<td>0.7 (1.1)</td>
<td>0.5 (0.9)*</td>
<td>0.5 (0.9)</td>
<td>0.3 (0.7)</td>
</tr>
<tr>
<td>Hot or cold spells</td>
<td>1.0 (1.1)*</td>
<td>0.4 (0.7)</td>
<td>1.2 (1.3)</td>
<td>0.5 (0.8)</td>
<td>0.6 (0.9)</td>
<td>0.4 (0.8)</td>
</tr>
<tr>
<td>Numbness or tingling</td>
<td>1.0 (1.0)*</td>
<td>0.2 (0.4)</td>
<td>1.0 (1.1)</td>
<td>0.6 (0.9)*</td>
<td>0.7 (1.0)</td>
<td>0.5 (0.8)</td>
</tr>
<tr>
<td>Weakness</td>
<td>1.0 (1.1)*</td>
<td>0.7 (1.2)</td>
<td>1.1 (1.1)</td>
<td>0.7 (0.9)</td>
<td>0.8 (0.9)</td>
<td>0.5 (0.8)</td>
</tr>
<tr>
<td>Heavy feeing in arms, legs</td>
<td>0.6 (1.0)*</td>
<td>0.2 (0.6)</td>
<td>0.8 (1.1)</td>
<td>0.3 (0.7)</td>
<td>0.4 (0.8)</td>
<td>0.2 (0.5)</td>
</tr>
<tr>
<td>Nausea, upset stomach</td>
<td>1.1 (1.0)*</td>
<td>0.5 (0.5)</td>
<td>1.5 (1.3)</td>
<td>0.5 (0.8)*</td>
<td>0.7 (0.9)</td>
<td>0.3 (0.6)</td>
</tr>
<tr>
<td>Constipation</td>
<td>0.7 (1.0)*</td>
<td>0.3 (0.5)</td>
<td>0.8 (1.1)</td>
<td>0.2 (0.6)</td>
<td>0.4 (0.8)</td>
<td>0.2 (0.5)</td>
</tr>
<tr>
<td>Loose bowel movements, diarrhea</td>
<td>0.5 (0.9)*</td>
<td>0.2 (0.4)</td>
<td>0.7 (1.2)</td>
<td>0.2 (0.5)</td>
<td>0.3 (0.7)</td>
<td>0.2 (0.5)</td>
</tr>
<tr>
<td>Pain – stomach</td>
<td>1.7 (1.3)*</td>
<td>1.0 (1.0)</td>
<td>2.3 (1.4)*</td>
<td>1.3 (1.0)*</td>
<td>1.4 (1.1)*</td>
<td>0.6 (0.8)</td>
</tr>
<tr>
<td>Condition</td>
<td>Score 1</td>
<td>Score 2</td>
<td>Score 3</td>
<td>Score 4</td>
<td>Score 5</td>
<td>Score 6</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Heart beating too fast</td>
<td>0.5 (0.8) *</td>
<td>0.0</td>
<td>0.8 (1.2) *</td>
<td>0.5 (0.9) *</td>
<td>0.5 (0.9) *</td>
<td>0.3 (0.7)</td>
</tr>
<tr>
<td>Difficulty in swallowing</td>
<td>0.5 (0.9) *</td>
<td>0.1 (0.3)</td>
<td>0.3 (0.5)</td>
<td>0.2 (0.5)</td>
<td>0.3 (0.7) *</td>
<td>0.2 (0.5)</td>
</tr>
<tr>
<td>Losing voice</td>
<td>0.3 (0.7) *</td>
<td>0.0</td>
<td>0.3 (0.5)</td>
<td>0.2 (0.6)</td>
<td>0.2 (0.6)</td>
<td>0.2 (0.6)</td>
</tr>
<tr>
<td>Blurred vision</td>
<td>0.7 (1.1) *</td>
<td>0.5 (0.7)</td>
<td>1.0 (1.2) *</td>
<td>0.4 (0.7)</td>
<td>0.5 (0.9) *</td>
<td>0.3 (0.7)</td>
</tr>
<tr>
<td>Vomiting, throwing up</td>
<td>0.4 (0.8) *</td>
<td>0.4 (0.5)</td>
<td>0.6 (0.9) *</td>
<td>0.3 (0.6) *</td>
<td>0.3 (0.7) *</td>
<td>0.2 (0.5)</td>
</tr>
<tr>
<td>Feeling bloated, gassy</td>
<td>0.6 (1.0) *</td>
<td>0.5 (0.7)</td>
<td>0.5 (0.9) *</td>
<td>0.5 (0.8) *</td>
<td>0.5 (0.9) *</td>
<td>0.2 (0.6)</td>
</tr>
<tr>
<td>Food makes you sick</td>
<td>0.3 (0.8) *</td>
<td>0.2 (0.4)</td>
<td>0.6 (1.1) *</td>
<td>0.1 (0.5)</td>
<td>0.2 (0.7) *</td>
<td>0.1 (0.4)</td>
</tr>
<tr>
<td>Pain – Knees, elbows, joints</td>
<td>0.6 (1.0) *</td>
<td>0.2 (0.6)</td>
<td>0.8 (1.1) *</td>
<td>0.4 (0.7)</td>
<td>0.5 (0.8) *</td>
<td>0.3 (0.7)</td>
</tr>
<tr>
<td>Pain – arms, legs</td>
<td>1.1 (1.1) *</td>
<td>0.4 (0.7)</td>
<td>1.4 (1.4) *</td>
<td>0.7 (0.9)</td>
<td>0.9 (1.0) *</td>
<td>0.5 (0.9)</td>
</tr>
<tr>
<td>Total somatization score</td>
<td>18.9 (11.6) *</td>
<td>10.2 (5.5)</td>
<td>24.2 (13.6) *</td>
<td>12.8 (9.8) *</td>
<td>15.2 (11.1) *</td>
<td>8.4 (8.8)</td>
</tr>
</tbody>
</table>

AP-FGIDs = abdominal pain-predominant functional gastrointestinal disorders

*p<0.05, compared to controls, unpaired t-test
Mellon and colleagues reported a significantly higher prevalence of fecal incontinence in children exposed to abuse. In contrast to this, Tam et al. failed to find an association between constipation and abuse. The relationship between child abuse and the four main types of AP-FGIDs 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.

One previous study, conducted in 10 adult females with IBS has shown greater pain in those exposed to abuse. Similarly, another adult study conducted in females attending a gastroenterology clinic has shown a significant association between greater pain severity and exposure to abuse. 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-FGIDs 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 ages 10-16 years, using Rome III criteria, has reported AP-FGIDs in 12.5% of affected children, and the prevalence AP-FGIDs in the current study is higher than that reported earlier. In addition we have also shown that the prevalence of AP-FGIDs has a 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-FGIDs reported was IBS, while in the current study the most prevalent AP-FGIDs is functional abdominal pain. The exact reasons for these differences are unclear. The 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. The previous studies have also reported a female preponderance.

In this study, we have assessed the somatization score in children with AP-FGIDs. Scores obtained for all somatic symptoms were significantly higher in those with AP-FGIDs than in controls, except for losing voice. Extra-intestinal somatic symptoms were also common in our children with AP-FGIDs. Headache, back pain and limb pain were the most common somatic symptoms observed in our teenagers with AP-FGIDs apart from abdominal pain. 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-FGIDs. 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-FGIDs 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-FGIDs. Therefore, inquiring about the 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. However, there were no previous studies to evaluate this relationship in details in pediatric age group.

Exact pathophysiological mechanism explaining the association between exposure to abuse and presence of gastrointestinal symptoms are not clear. However, several possible underlying mechanisms have been postulated to explain gastrointestinal symptoms in those exposed to abuse. Functional gastrointestinal disorders including AP-FGIDs are considered as disorders of dysregulation of the brain-gut communication system or the brain-gut axis. 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.

In this study we have recruited teenagers aged 13 to 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-FGIDs, 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-FGIDs 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. Similar results have been reported from other countries as well. The organic diseases observed in the previous study include urinary tract infection, gastro-esophageal reflux disease, urinary calculi, antral gastritis, and intestinal amoebiasis. Parasitic infestations such as giardiasis and amoebiasis have been considered to be possible mimickers of FGIDs; however, in that study, prevalence of these diseases was 1.8%, similar to several previous studies conducted in Sri Lanka. 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-FGIDs in teenagers who have been exposed to physical, sexual, and emotional abuse. Those with AP-FGIDs 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-FGIDs exposed to abuse than those not exposed to such events.

REFERENCES


