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Somatic Complaints in Childhood Functional Abdominal Pain Are Associated With Functional Gastrointestinal Disorders in Adolescence and Adulthood

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Abstract

Objectives—Nongastrointestinal (non-GI) somatic complaints are common in children and adults with functional gastrointestinal disorders (FGIDs). The aim of the present study was to determine whether non-GI somatic complaints in children with functional abdominal pain (FAP) were associated with FGIDs in adolescence and young adulthood.

Patients and Methods—In a prospective clinic-based study, children and adolescents (ages 8–16 years) with FAP (n = 188) and well controls (n = 61) completed a validated measure of somatic symptoms. Participants were assessed 4 to 15 years later (as older adolescents and young adults) for presence of current FGIDs as defined by the Rome III criteria.

Results—Of the 188 youths with pediatric FAP, 35.6% met criteria for FGIDs at follow-up. Initial levels of non-GI somatic symptoms were significantly higher in pediatric FAP participants who subsequently met criteria for FGIDs at follow-up compared with controls and pediatric FAP participants who did not meet criteria for FGIDs at follow-up.

Conclusions—The association of non-GI somatic symptoms with FAP in children may identify a group that is at risk for FGIDs later in life.

Keywords

adolescents; children; chronic abdominal pain; follow-up; gastrointestinal; somatic symptoms

Chronic or recurrent abdominal pain affects 8% to 25% of healthy school-age children (1–3) and is characterized by continuous or episodic abdominal pain. In most cases, the pain is functional—it cannot be adequately explained by structural or biochemical abnormalities (4). Pediatric functional abdominal pain (Ped-FAP) persists throughout development in a significant proportion of children (1,5–8) and has been linked to functional gastrointestinal disorders (FGIDs) such as irritable bowel syndrome in adulthood (7,9,10).

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The authors report no conflicts of interest.

Despite evidence that Ped-FAP may persist for years, the field has not yet identified factors that reliably predict which pediatric patients will have FGIDs in adolescence and adulthood. One promising factor is the expression of nongastrointestinal (non-GI) somatic symptoms. Non-GI somatic symptoms have been linked to higher levels of disability (11) and emotional distress (12) in patients with Ped-FAP. Moreover, a prospective cohort study identified a subgroup of patients with Ped-FAP characterized by consistently high levels of somatic symptoms at each assessment during a 5-year period following their initial medical evaluation (13). These findings suggest that non-GI somatic symptoms may be a useful marker of increased risk for poor long-term outcomes in patients with Ped-FAP.

The present study is based on data from a cohort of patients with Ped-FAP and well controls studied prospectively for 4 to 15 years. The study aimed to determine whether non-GI somatic symptoms reported by patients with Ped-FAP at their initial medical evaluation were relevant to predicting which patients with Ped-FAP would subsequently meet criteria for FGIDs as adolescents and young adults. We assessed non-GI somatic symptoms in well controls and in patients with Ped-FAP at the time of their evaluation at a pediatric gastroenterology clinic. At follow-up, we assessed the Rome III symptom criteria for abdominal pain–predominant FGIDs. We hypothesized that patients with Ped-FAP with higher baseline levels of non-GI somatic symptoms would have a greater risk of FGIDs at follow-up.

PATIENTS AND METHODS

Sample

Participants in the present study were enrolled between the ages of 8 and 16 years in an ongoing prospective study of chronic abdominal pain in children and adolescents. Participants in the Ped-FAP group were first enrolled in studies conducted by Walker et al (14–16) between 1993 and 2004 after presentation to Vanderbilt Pediatric Gastroenterology Clinic for the evaluation of chronic or recurrent abdominal pain. Participants whose medical evaluation yielded no evidence of organic disease were eligible for the present study and were recruited on average 10.0 years (± 3.69 years) after initial evaluation. Of the 199 eligible participants invited to participate in the ongoing follow-up study, 11 declined, leaving a Ped-FAP sample of 188. The Ped-FAP sample comprised 59% girls, primarily white (91%) and with a mean age of 11.7 years (± 2.91 years) at initial evaluation.

Well control subjects of similar age and sex were recruited from community schools to participate in the original studies conducted by Walker and colleagues. These participants had no chronic illness and no abdominal pain in the month preceding initial study participation. They were recruited for the present follow-up study on average 5.4 years (± 0.81 years) after initial participation. Of the 67 eligible control participants invited to participate in the ongoing follow-up study to date, 4 declined and 2 met criteria for an FGID at follow-up and were excluded from the control group, leaving a well control sample of 61. The well control sample comprised 52% girls, primarily white (95%) and with a mean age of 11.0 years (± 2.42) at initial evaluation, and did not differ significantly from the Ped-FAP sample on demographic variables.

Procedure

The Vanderbilt University institutional review board approved all of the procedures. After providing informed consent, patient participants responded to a health interview in the waiting room before their medical evaluation. Participants in the well control group were interviewed during a class period at their school. All of the participants were interviewed 4 to 15 years later by telephone for the follow-up study.

Measures

Gastrointestinal and Nongastrointestinal Somatic Symptoms—GI and non-GI somatic symptoms were assessed at initial evaluation with the Children's Somatization Inventory (CSI (17)). The CSI is a validated self-report questionnaire for children and adolescents. It includes 9 GI symptoms (eg, abdominal pain, nausea, constipation, diarrhea, bloating) and 26 non-GI symptoms (eg, dizziness, back pain, headaches, sore muscles). Participants rate the extent to which they have experienced each symptom in the last 2 weeks on a 4-point scale ranging from *not at all* to *a whole lot*. For the present study, symptoms were considered present if they were rated 3 (*a lot*) or 4 (*a whole lot*). We computed subscales representing the total number of GI and non-GI symptoms reported by each participant. Both subscales had good internal consistency with Cronbach alpha coefficients of 0.80 and 0.86 for the GI and non-GI symptom subscales, respectively.

Rome III Diagnostic Questionnaire for Functional Gastrointestinal Disorders—

The Rome III questionnaire was developed by the Rome Foundation Board based on the Rome III criteria for FGID (18). The present study administered only the 24 questionnaire items that assess symptom criteria for FGIDs associated with abdominal pain: irritable bowel syndrome, functional dyspepsia, abdominal migraine, FAP, and FAP syndrome. Pediatric Rome III criteria were applied to participants who were younger than 18 years old at follow-up; adult criteria were used for those 18 years and older at follow-up. Participants' responses were scored to determine whether they currently met symptom criteria for each of the FGIDs at follow-up. Patients with Ped-FAP who at follow-up met symptom criteria for 1 or more FGIDs were classified as "FGID positive" (FGID-POS) and those who did not meet symptom criteria for any FGID at follow-up were classified as "FGID negative" (FGID-NEG).

Statistical Analysis

All of the analyses used SPSS for Windows version 17 statistical package (SPSS, Inc, Chicago, IL). Descriptive analyses were performed using χ^2 tests. Primary hypotheses were tested with analyses of covariance comparing well controls, FGID-POS, and FGID-NEG groups by sex with age as a covariate. Analyses of variance with Tukey honestly significant difference (HSD) tests were used for all of the planned comparisons between groups and FGID subtypes. All of the probability values reported are 2-tailed with a $P < 0.05$ criterion for significance.

RESULTS

Of the 188 patients with Ped-FAP, 67 (35.6%) met Rome III criteria for a FGID at follow-up and were classified as FGID-POS. The remaining 64.4% of participants in the Ped-FAP group were classified as FGID-NEG at follow-up. Table 1 presents demographic characteristics of the FGID-NEG, FGID-POS, and control groups. The 3 groups differed significantly in sex composition, χ^2 (2, $N = 249$) = 6.44, $P < 0.05$. All of the groups included more women than men, but the FGID-POS had the greatest prevalence of women (70%). To control for this, sex was included as a factor in all subsequent analyses.

Figure 1 shows the levels of non-GI somatic symptoms at the initial evaluation for well controls and for patients who were subsequently classified as FGID-POS or FGID-NEG at follow-up. The 3 groups differed significantly on initial evaluation of non-GI somatic symptoms, F (2, 241) = 5.00, $P < 0.01$. Tukey HSD tests showed that initial levels of non-GI somatic symptoms were significantly higher in the FGID-POS group compared with both the FGID-NEG group ($P < 0.01$) and the well control group ($P < 0.01$). The FGID-NEG and well controls did not differ in the number of non-GI symptoms reported at the initial

evaluation ($P = ns$). Figure 2 shows 8 non-GI symptoms most frequently endorsed at the initial evaluation and the percentage of each group that reported each symptom.

Initial levels of GI symptoms also differed among the FGID-POS, FGID-NEG, and well control groups, $F(2, 241) = 18.44$, $P < 0.01$. Tukey HSD tests revealed that both FGID-NEG and FGID-POS groups reported significantly more GI symptoms at initial evaluation compared with the well control participants (all < 0.01). The FGID-POS group also reported significantly more GI symptoms than the FGID-NEG group at initial evaluation, $P < 0.01$ (Fig. 1). Figure 3 shows the percentage of participants in each group endorsing each of the 9 GI symptoms at initial evaluation.

DISCUSSION

Results of this prospective study showed that more than one-third (36%) of patients with Ped-FAP met symptom criteria for 1 or more FGIDs at a follow-up assessment 4 to 15 years after their initial medical evaluation. This finding is consistent with other reports (5) linking Ped-FAP to FGIDs in adulthood and has the benefit of a more rigorous prospective design and application of Rome III symptom criteria for FGIDs at follow-up.

Unique to the present study, we found that a high level of non-GI symptoms at the initial pediatric evaluation was associated with a greater likelihood of FGIDs in adolescence and young adulthood. In contrast, patients with Ped-FAP who did not subsequently meet criteria for FGIDs had baseline levels of non-GI symptoms similar to those of well controls. Thus, the presence of non-GI somatic symptoms such as back pain, weakness, and low energy may help differentiate a population of patients with Ped-FAP at high risk for FGIDs across the course of development.

It may be that individuals with functional somatic disorders are predisposed to a general heightened sensory responsiveness throughout the body (19). Enhanced responsiveness to pain and bodily sensations has been implicated in fibromyalgia, chronic fatigue syndrome (19,20), and headache (21). A recent study (22) showed evidence of neuronal changes in patients with functional pain disorders—specifically loss of gray matter in cortical areas (cingulate, insular, and prefrontal cortices) involved in the subjective, emotional experience of pain. Changes in the composition or function of these brain regions may affect how pain and bodily sensations are processed at the central level (22,23). Future studies should test the relation between somatic symptom reporting and responsiveness to painful visceral and somatic stimuli in pediatric FAP.

The Ped-FAP group that went on to develop FGIDs years later as adolescents and adults (FGID-POS) also reported significantly more GI symptoms at initial evaluation compared with well controls and those classified as FGID-NEG at follow-up. However, patients with Ped-FAP whose abdominal pain eventually resolved (FGID-NEG) also reported significantly more GI symptoms at initial evaluation compared with the well control group. Because both FGID-POS and FGID-NEG groups reported more GI symptoms than controls, the number of GI symptoms at initial evaluation may not be as useful as a predictor of future FGIDs as non-GI symptoms.

The present study had several limitations that suggest directions for future research. First, our patients with Ped-FAP were recruited from a tertiary care setting. Additional work is needed to evaluate whether findings generalize to patients with Ped-FAP in other settings. Second, we focused exclusively on non-GI somatic symptoms as a potential factor for long-term persistence of FGIDs. Assessment of non-GI symptoms may easily be incorporated into the medical evaluation during the clinical interview or by means of a questionnaire (17) and, therefore, has potential clinical utility. Non-GI symptoms, however, may be only 1

feature of a symptom complex that includes psychiatric comorbidities as well as family and environmental stressors. It is possible that all of these factors covary with non-GI symptoms during the course of development. Another limitation of the present study is that follow-up assessment was based on self-report of Rome III symptoms and did not include a medical evaluation to rule out organic disease. Therefore, we cannot rule out the possibility that, in some cases, GI symptoms reported at follow-up reflected underlying disease. Also, we do not know how treatment history (if any) may or may not have affected FGID outcome in the pediatric FAP group.

Multiple studies have shown that patients with FGIDs have increased health care use, and irritable bowel syndrome itself has been shown to be a large health care burden (24–28). The ability to identify children with FAP who are at risk for FGIDs in adulthood may provide the opportunity to alter the trajectory of these individuals' health outcomes. If at-risk children could be identified on the basis of assessment of somatic comorbidities, this population could be targeted for interventions such as cognitive behavioral therapy, which has been shown to benefit pediatric patients with FGIDs (9,29). These interventions may have a greater effect if done at an early age. Moreover, identification of pediatric patients at risk for persistent FGIDs may offer the opportunity to direct limited resources to these patients, resulting in later savings to the health care system.

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References

1. Apley J, Hale B. Children with recurrent abdominal pain: how do they grow up? *Br Med J* 1973;3:7–9. [PubMed: 4717440]
2. Chitkara DK, Rawat DJ, Talley NJ. The epidemiology of childhood recurrent abdominal pain in Western countries: a systematic review. *Am J Gastroenterol* 2005;100:1868–75. [PubMed: 16086724]
3. Konijnenberg AY, de Graeff-Meeder ER, van der Hoeven J, et al. Psychiatric morbidity in children with medically-unexplained chronic pain: diagnosis from the pediatrician's perspective. *Pediatrics* 2006;117:889–97. [PubMed: 16510672]
4. Rasquin A, Di Lorenzo C, Forbes D, et al. Childhood functional gastrointestinal disorders: child/adolescent. *Gastroenterology* 2006;130:1527–37. [PubMed: 16678566]
5. Gieteling MJ, Bierma-Zeinstra SM, Passchier J, et al. Prognosis of chronic or recurrent abdominal pain in children. *J Pediatr Gastroenterol Nutr* 2008;47:316–26. [PubMed: 18728528]
6. Walker LS, Garber J, Van Slyke DA, et al. Long-term health outcomes in patients with recurrent abdominal pain. *J Pediatr Psychol* 1995;20:233–45. [PubMed: 7760222]
7. Walker LS, Guite JW, Duke M, et al. Recurrent abdominal pain: a potential precursor of irritable bowel syndrome in adolescents and young adults. *J Pediatr* 1998;132:1010–5. [PubMed: 9627595]
8. Christensen MF, Mortensen O. Long-term prognosis in children with recurrent abdominal pain. *Arch Dis Child* 1975;50:110–4. [PubMed: 1130815]
9. Chitkara DK, van Tilburg MA, Blois-Martin N, et al. Early life risk factors that contribute to irritable bowel syndrome in adults: a systematic review. *Am J Gastroenterol* 2008;103:765–74. [PubMed: 18177446]
10. Howell S, Poulton R, Talley NJ. The natural history of childhood abdominal pain and its association with adult irritable bowel syndrome: birth-cohort study. *Am J Gastroenterol* 2005;100:2071–8. [PubMed: 16128954]

11. Claar RL, Walker LS. Functional assessment of pediatric pain patients: psychometric properties of the functional disability inventory. *Pain* 2006;121:77–84. [PubMed: 16480823]
12. Little CA, Williams SE, Puzanovova M, et al. Multiple somatic symptoms linked to positive screen for depression in pediatric patients with chronic abdominal pain. *J Pediatr Gastroenterol Nutr* 2007;44:528–62.
13. Mulvaney S, Lambert EW, Garber J, et al. Trajectories of symptoms and impairment for pediatric patients with functional abdominal pain: a 5-year longitudinal study. *J Am Acad Child Adolesc Psychiatry* 2006;46:737–44. [PubMed: 16721324]
14. Walker LS, Garber J, Smith CA, et al. The relation of daily stressors to somatic and emotional symptoms in children with and without recurrent abdominal pain. *J Consult Clin Psychol* 2001;69:85–91. [PubMed: 11302281]
15. Walker LS, Smith CA, Garber J, et al. Testing a model of pain appraisal and coping in children with chronic abdominal pain. *Health Psychol* 2005;24:364–74. [PubMed: 16045372]
16. Walker LS, Baber KF, Garber J, et al. A typology of pain coping strategies in pediatric patients with chronic abdominal pain. *Pain* 2008;137:266–75. [PubMed: 17928144]
17. Walker LS, Beck JE, Garber J, et al. The Children's Somatization Inventory: psychometric properties of the revised form (CSI-24). *J Pediatr Psychol* 2009;34:430–40. [PubMed: 18782857]
18. Drossman, DA.; Corazziari, E.; Delvaux, M., et al. Rome III: The Functional Gastrointestinal Disorders. 3. McLean, VA: Degnon Associates; 2006.
19. Geisser ME, Donnell CS, Petzke F, et al. Comorbid somatic symptoms and functional status in patients with fibromyalgia and chronic fatigue syndrome: sensory amplification as a common mechanism. *Psychosomatics* 2008;49:235–42. [PubMed: 18448779]
20. Yunus MB, Masi AT. Juvenile primary fibromyalgia syndrome. A clinical study of thirty-three patients and matched normal controls. *Arthr Rheum* 1985;28:138–45. [PubMed: 3871615]
21. Aamodt AH, Stovner LJ, Hagen K, et al. Comorbidity of headache and gastrointestinal complaints: the Head-HUNT study. *Cephalalgia* 2007;28:144–51. [PubMed: 18197884]
22. Valet M, Gundel H, Sprenger T, et al. Patients with pain disorder show gray-matter loss in pain-processing structures: a voxel-based morpho-metric study. *Psychosom Med* 2009;71:49–56. [PubMed: 19073757]
23. Lane RD, Waldstein SR, Critchley HD, et al. The rebirth of neu-roscience in psychosomatic medicine, part II: clinical applications and implications for research. *Psychosom Med* 2009;71:135–51. [PubMed: 19196806]
24. Campo JV, Comer DM, Jansen-McWilliams L, et al. Recurrent pain, emotional distress, and health service use in childhood. *J Pediatr* 2002;141:76–83. [PubMed: 12091855]
25. Camilleri M, Choi MG. Review article: irritable bowel syndrome. *Aliment Pharmacol Ther* 1997;11:3–15. [PubMed: 9042970]
26. Drossman DA, Camilleri M, Mayer EA, et al. AGA technical review of irritable bowel syndrome. *Gastroenterology* 2002;123:2108–31. [PubMed: 12454866]
27. Cash B, Sullivan S, Barghout V. Total costs of IBS: employer and managed care perspective. *Am J Manag Care* 2005;11:S7–16. [PubMed: 15926759]
28. Levy RL, Von Korff M, Whitehead WE, et al. Costs of care for irritable bowel syndrome patients in a health maintenance organization. *Am J Gastroenterol* 2001;96:3122–9. [PubMed: 11721759]
29. Youssef NN, Rosh JR, Loughran M, et al. Treatment of functional abdominal pain in childhood with cognitive behavioral strategies. *J Pediatr Gastroenterol Nutr* 2004;39:192–6. [PubMed: 15269627]

FIGURE 1.

Mean number of somatic symptoms (non-GI and GI) in the previous 2 weeks endorsed at initial evaluation by well controls and patients with Ped-FAP with (FGID-POS) or without (FGID-NEG) current FGID diagnoses (at follow-up). Error bars depict standard error of the mean. FGID = functional gastrointestinal disorder; Ped-FAP = pediatric functional abdominal pain.

FIGURE 2.

Percent (%) of participants in each group reporting nongastrointestinal symptoms from the Children's Somatization Inventory in the 2 weeks before the initial evaluation. The 8 most frequently endorsed symptoms are plotted. Symptoms were considered positive if participants endorsed them as occurring "a lot" or "a whole lot". FGID = functional gastrointestinal disorders.

FIGURE 3.

Percent of participants in each group reporting each of the 9 gastrointestinal symptoms from the Children's Somatization Inventory in the 2 weeks before the initial evaluation.

Symptoms were considered positive if participants endorsed them as occurring "a lot" or "a whole lot." FGID = functional gastrointestinal disorders.

TABLE 1

Demographic characteristics of study sample

Variable	Participant type		
	Well	FGID-NEG	FGID-POS
n	61	121	67
Age at initial evaluation, y, M $\pm$ SD	11.0 $\pm$ 2.42	11.6 $\pm$ 2.93	11.8 $\pm$ 2.89
Age at follow-up, y, M $\pm$ SD	16.4 $\pm$ 2.21	21.6 $\pm$ 4.36	21.3 $\pm$ 4.50
Sex, % female	52.5	52.1	70.0

Age is presented in years as mean (M) $\pm$ standard deviation (SD). FGID-NEG = functional gastrointestinal disorder negative; FGID-POS = functional gastrointestinal disorder positive.