

Prevalence of Symptoms of Gastroesophageal Reflux During Childhood

A Pediatric Practice-Based Survey

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Objectives: To determine the prevalence of symptoms associated with gastroesophageal reflux (GER) in 3- to 17-year-old children, to describe the prevalence of factors associated with GER in these children, and to determine the percentage of symptomatic children who have been treated.

Design: A cross-sectional survey.

Setting: Sixteen pediatric practice research group practices in the Chicago, Ill, area (urban, suburban, and semirural).

Participants: A total of 566 parents of 3- to 9-year-old children, 584 parents of 10- to 17-year-old children, and 615 children aged 10 to 17 years.

Intervention: None.

Main Outcome Measure: Reported frequency of symptoms associated with GER.

Results: Parents of 3- to 9-year-old children reported that their children experienced a sensation of heartburn ("burning/painful feeling in middle of chest"), epigastric pain ("stomachache above belly button"), and regurgitation ("sour taste or taste of throw up") 1.8%, 7.2%, and 2.3% of the time, respectively. Parents of 10- to 17-year-old children reported that their children experienced the same symptoms 3.5%, 3.0%, and 1.4% of the time, while children aged 10 to 17 years reported the

symptoms 5.2%, 5.0%, and 8.2% of the time, respectively. Complaints of abdominal pain ("stomachache") were most common, reported by 23.9% and 14.7% of parents of 3- to 9-year-old and 10- to 17-year-old children and by 27.9% of children aged 10 to 17 years. In those aged 10 to 17 years, heartburn reported by the children was associated with reported cigarette use (odds ratio, 6.5; 95% confidence interval, 2-21); no other complaint was associated with cigarette, alcohol, or caffeine consumption or passive smoking exposure. In 3- to 9-year-old children, no complaint was associated with caffeine consumption or passive smoking exposure. Reported treatment in the past week with antacids was 0.5% according to parents of children aged 3 to 9 years and 1.9% and 2.3% according to parents of children aged 10 to 17 years and children aged 10 to 17 years, respectively. Treatment with over-the-counter histamine receptor blockers was 0% for children aged 3 to 9 years and 10 to 17 years, as reported by their parents, and 1.3% for those aged 10 to 17 years, as reported by themselves.

Conclusions: Symptoms suggestive of GER are not rare in childhood, yet only a fraction of children with symptoms are treated with over-the-counter antacids or histamine₂ antagonists. Prospective longitudinal data are needed to determine which children with symptoms of GER actually have GER disease and are at risk of developing complications.

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Editor's Note: I hope this study will lead to another that will determine how many children and teenagers actually have gastroesophageal reflux and how many are only plain, young belly-achers.

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The affiliations of the authors appear in the acknowledgment section at the end of the article. A complete list of the participating members of the Pediatric Practice Research Group appears on page 154.

COMPLAINTS suggestive of gastroesophageal reflux (GER) are known to be common in adults. Heartburn occurs in 15% to 20% of adults in any given week,¹⁻³ and in more than 40% in a month. Gastroesopha-

geal reflux is also common in infants. A recent prevalence study⁴ in infants demonstrated that at least 1 episode of regurgitation a day was reported in half of infants aged 0 to 3 months. Yet, information on the prevalence of symptoms associated with GER during childhood after infancy is lacking.

This report describes the prevalence of symptoms associated with GER in 3- to 17-year-old children attending pediatricians' offices, the prevalence of factors associated with GER in these children, and the percentage of symptomatic children who have been treated.

PARTICIPANTS AND METHODS

THE CHILDHOOD GER QUESTIONNAIRE

The childhood GER questionnaire was devised based on several adult survey instruments.^{1,5-7} There were 3 forms of the questionnaire: separate forms for parents of children aged 3 to 9 years and 10 to 17 years and 1 for children aged 10 to 17 years. Each instrument took less than 5 minutes to complete.

Table 1 lists the questions asked in all 3 questionnaires. The childhood GER questionnaire for parents of children aged 3 to 9 years collects information via 17 questions: 7 on demographic information, 7 on symptoms, 2 on exposure (caffeine and passive smoking), and 1 on medications for GER. The childhood GER questionnaire for parents of children aged 10 to 17 years included 2 additional exposure questions (regarding cigarette and alcohol consumption). The childhood GER questionnaire for children aged 10 to 17 years was identical to the childhood GER questionnaire for parents of children aged 10 to 17 years except that it excluded 2 demographic questions (regarding parental educational level and race). Questions were worded so as to elicit information concerning only the week before administering the questionnaire.

INSTRUMENT RELIABILITY

To assess the reliability of the survey instruments, a sample of 110 English-speaking patients from the continuity clinic at Children's Memorial Medical Center, Chicago, Ill, was called after completing the initial survey during a clinic visit, and the entire questionnaire was administered a second time over the telephone to permit analysis of test-retest reliability.

SUBJECTS

From June through August 1996, questionnaires were distributed to parents of children aged 3 to 17 years and to children aged 10 to 17 years in 16 practices in the Pediatric

Practice Research Group (affiliated with Children's Memorial Medical Center). The Pediatric Practice Research Group is a research consortium of practices in Chicago and its surrounding area; it includes urban, suburban, and semirural offices.^{8,9} In 9 practices, surveys were distributed by office personnel trained by the lead investigator (S.P.N.); in the other 7 practices, they were distributed by trained research assistants.

Daily appointment schedules or sign-in logs from each participating practice were reviewed to ascertain the proportion of eligible participants who completed the survey instrument. Of the age-eligible participants, 78% completed the questionnaire; 9% of eligible participants who were given a questionnaire refused to participate, and study staff were unsuccessful in distributing surveys to 13% of eligible participants.

Children who had a chronic medical or developmental problem and those with an acute illness in the past week were not included in the study, as these factors could contribute to symptoms of GER. Surveys that did not include the child's age were excluded.

This article reports only on the responses of the 566 parents of 3- to 9-year-old children, the 584 parents of 10- to 17-year-old children, and the 615 children aged 10 to 17 years. The latter 2 groups included 526 child-parent pairs. Some children who completed the survey did not come to the office visit with their parent, and other children were unable or unwilling to complete the survey while their parents participated in the study.

DATA ANALYSIS

Reliability of the survey instruments was assessed by means of test-retest consistency using proportion of agreement. Association of a symptom with each exposure and demographic variable was analyzed by the χ^2 test. A multiple logistic regression technique was used to calculate adjusted odds ratios. Differences in the reporting of symptoms by parents compared with children were analyzed by the McNemar test for correlated proportions.

The study was approved by the Institutional Review Board at Children's Memorial Medical Center.

RESULTS

RELIABILITY OF THE SURVEY INSTRUMENTS

The median number of days elapsed between the survey and the retest was 15, 17, and 17 for the childhood GER questionnaire for parents of children aged 3 to 9 years ($n = 55$), the childhood GER questionnaire for parents of children aged 10 to 17 years ($n = 28$), and the childhood GER questionnaire for children aged 10 to 17 years ($n = 27$), respectively. The median proportion of agreement for each questionnaire was 0.93, 0.93, and 0.92, respectively.

DESCRIPTION OF STUDY RESPONDENTS

Table 2 presents the characteristics of the study children and parents, recruited from 16 practices. Surveys

were completed by 566 parents of 3- to 9-year-old children, 584 parents of 10- to 17-year-old children, and 615 children aged 10 to 17 years. The latter 2 groups included 526 child-parent pairs. Some children who completed the survey did not come to the office visit with their parent, and other children were unable or unwilling to complete the survey while their parents participated in the study. Most of the parent respondents considered themselves "white," and many were college graduates.

SYMPTOMS OF GER

Figure 1 and **Figure 2** present the percentage of respondents reporting symptoms of GER in the past week. Parents of 3- to 9-year-old children reported that their children experienced a sensation of heartburn ("burning/painful feeling in middle of chest"), epigastric pain ("stom-

Table 1. Questions on Survey Instruments*

Item	GER3-9P	GER10-17P	GER10-17C
Demographic			
Age	✓	✓	✓
Sex	✓	✓	✓
Sick in past 2 wk	✓	✓	✓
Chronic medical problems	✓	✓	✓
Race or ethnicity	✓	✓	...
Highest grade completed	✓	✓	...
Relationship to child	✓	✓	...
Symptoms†			
Do you/your child throw up?	✓	✓	✓
Do you/your child complain of feeling like throwing up or feeling nauseous?	✓	✓	✓
Do you/your child complain of having a burning or painful feeling in the middle of his/her chest?	✓	✓	✓
Do you/your child complain of having a stomachache?	✓	✓	✓
Do you/your child complain of having a stomachache which was <i>above</i> his/her belly button?	✓	✓	✓
Do you/your child complain of having a sour taste, like the taste of throw up, in his/her mouth?	✓	✓	✓
Do you/your child complain of it hurting to swallow food or drink in the past week?	✓	✓	✓
Exposure†			
Did you/your child drink any caffeine in the past week?	✓	✓	✓
Have you/your child smoked cigarettes in the past week?	...	✓	✓
Has anyone smoked cigarettes in your home in the past week?	✓	✓	✓
Did you/your child drink any alcohol in the past week?	...	✓	✓
Treatment†			
Have you/your child taken any medications in the past week (including antacids, over-the-counter Tagamet or Pepcid, other)?	✓	✓	✓

*GER3-9P indicates childhood gastroesophageal reflux questionnaire for parents of children aged 3 to 9 years; GER10-17P, childhood gastroesophageal reflux questionnaire for parents of children aged 10 to 17 years; GER10-17C, childhood gastroesophageal reflux questionnaire for children aged 10 to 17 years; and ellipses, the item did not appear on that questionnaire.

†“You” is used for GER10-17C and “your child” for the other 2 questionnaires.

achache above belly button”), and regurgitation (“sour taste or taste of throw up”) 1.8%, 7.2%, and 2.3% of the time, respectively. Parents of 10- to 17-year-old children reported that their children experienced the same symptoms 3.5%, 3.0%, and 1.4% of the time, while children aged 10 to 17 years reported the symptoms 5.2%, 5.0%, and 8.2% of the time, respectively. Complaints of abdominal pain (“stomachache”) were most common, reported by 23.9% and 14.7% of the parents of 3- to 9-year-old children and 10- to 17-year-old children, respectively, and by 27.9% of the children aged 10 to 17 years. Other less frequent symptoms of vomiting (“throw up”),

Table 2. Characteristics of the Child or Parent*

	Parents of Children Aged 3-9 y	Parents of Children Aged 10-17 y	Children Aged 10-17 y
Child			
Male sex	51	50	48
Median age, y	5.6	13.2	13.6
Parent			
College graduate	57	56	NA
White (non-Hispanic)	76	91	NA
Forms completed by mother	92	89	NA

*Data are given as percentage of respondents unless otherwise indicated. NA indicates not applicable.

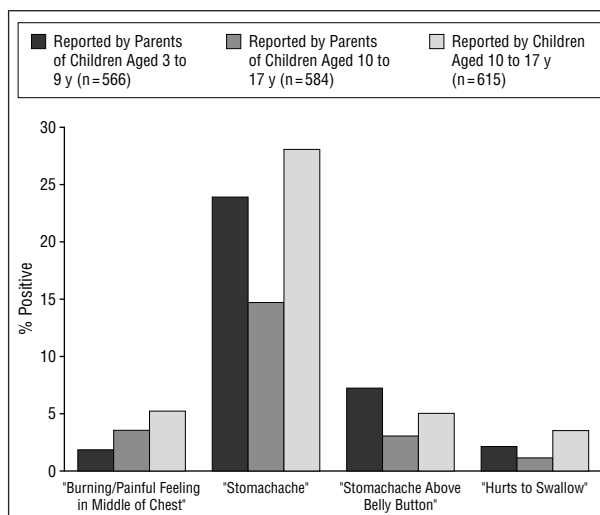


Figure 1. Percentage of reported gastroesophageal reflux symptoms (chest pain, abdominal pain, and odynophagia) in the past week.

nausea (“feels like throwing up or nauseous”), and odynophagia (“hurts to swallow”) are also shown.

It was uncommon for a child to complain of more than 1 GER symptom. The most common symptoms to cluster together were nausea and abdominal pain (reported by 2.2% of parents of children aged 3-9 years and by 4.4% of children aged 10-17 years); abdominal pain and epigastric pain (reported by 4.1% of parents of children aged 3-9 years and by 2.6% of children aged 10-17 years); and nausea, abdominal pain, and acid regurgitation (reported by 1.3% of children aged 10-17 years).

There were 2 differences in symptom frequency by sex: 10- to 17-year-old girls reported more symptoms of nausea (16.3% vs 8.9%; $P = .006$) and epigastric pain (6.7% vs 3.1%; $P = .04$) than boys the same age.

Reported treatment in the past week with antacids was 0.5% for children aged 3 to 9 years according to their parents, 1.9% for children aged 10 to 17 years according to their parents, and 2.3% for children aged 10 to 17 years according to themselves. Treatment with over-the-counter histamine₂ receptor blockers was 0% for children aged 3 to 9 years and 10 to 17 years, as reported by their parents, and 1.3% for children aged 10 to 17 years, as reported by themselves.

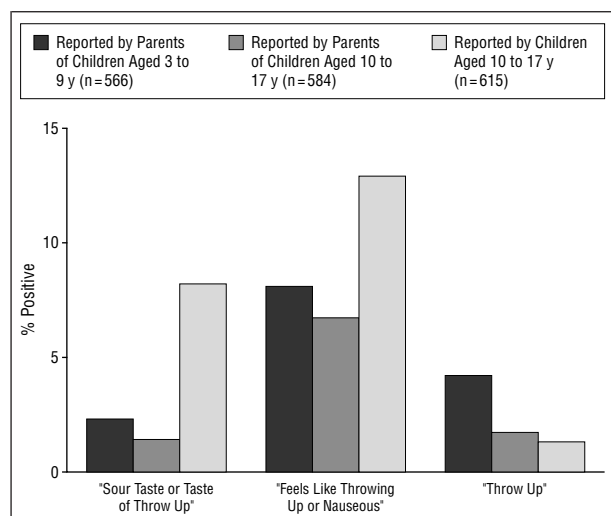


Figure 2. Percentage of reported gastroesophageal reflux symptoms (nausea or vomiting) in the past week.

ASSOCIATION OF GER SYMPTOMS WITH VARIOUS HABITS

In 10- to 17-year-old children, children who reported cigarette use were more likely than nonsmokers to complain of heartburn (25.0% vs 4.1%; $P = .01$). No other complaint was associated with cigarette, alcohol, or caffeine consumption or passive smoking exposure. In 3- to 9-year-old children, no complaint was associated with caffeine consumption or passive smoking exposure.

COMPARISON OF CHILD AND PARENTAL RESPONSES

Children aged 10 to 17 years were more likely than their parents to report yes to feels like throwing up or nauseous (11.2% vs 6.4%; $P < .01$), stomachache (27.9% vs 15.2%; $P < .01$), sour taste or taste of throw up (8.8% vs 1.9%; $P < .001$), and hurts to swallow (3.6% vs 1.1%; $P = .02$).

COMMENT

In this sample, symptoms suggestive of GER are not rare in childhood. In adults, heartburn and acid regurgitation are specific but not sensitive symptoms of GER disease diagnosed by 24-hour pH probe monitoring.¹⁰ Sensations of burning pain in the chest (heartburn) and acid regurgitation were reported as occurring on a weekly basis in about 2% of 3- to 9-year-old children and about 5% to 8% of 10- to 17-year-old children. The prevalence of at least weekly heartburn reported in children in this study is lower than that reported in adults (17.8%),² while the prevalence of acid regurgitation is comparable (6%).² It may be that regurgitation is not associated with complaints of heartburn because prolonged regurgitation is necessary to produce this symptom.

Clinical practice suggests that other symptoms may correlate with GER in children, including vomiting, nausea, abdominal pain, epigastric pain, and odynophagia. This study reports also on the frequency of these symptoms in children. The sensitivity and specificity of these

symptoms and acid regurgitation and heartburn in children need to be determined before the prevalence of symptoms caused by GER can be determined.

In this survey, only a fraction of the children with GER symptoms were treated with over-the-counter antacids or histamine₂ antagonists. Still, 2.3% of 10- to 17-year-old children reported treatment with antacids within the past week. This is a far lower rate than for adults, among whom 12.5% take indigestion aids (including antacids) 2 or more times a week.³ The difference in treatment patterns for these complaints between adults and children may not be solely explained by the frequency of complaints, and may reflect other factors. Children might be treated less frequently because their parents do not know the frequency of their complaints, as suggested by the finding that children were more likely to report nausea, abdominal pain, and acid regurgitation than their parents. This probably is because these symptoms are internal experiences vs overt events such as vomiting. This study underscores the importance of medical personnel asking older children about symptoms of GER during annual checkups.

Chest pain was associated with cigarette use, and this should alert practicing physicians to ask about smoking in older children complaining of this symptom. Cigarette smoking can cause chest pain from either respiratory tract disease or GER and esophagitis in adults. The mechanism causing esophageal disruption is probably multifactorial and includes cigarette smoking's effect on reducing the lower esophageal sphincter pressure, decreasing esophageal clearance, and producing free radicals and other mediators that result in tissue injury and decrease defense mechanisms.¹¹ Shabib et al¹² found that passive smoking is a risk factor for esophagitis in children with exposure to at least 10 cigarettes a day. In this study, passive smoking referred to any smoking in the house in the past week; the difference in definition might explain why this survey did not find it to be a risk factor for the development of symptoms of GER.

In our survey, chest pain and other symptoms of GER were not associated with caffeine intake or alcohol use. This is in contrast to adult studies¹³ that have found both of these to be risk factors for heartburn. Amount of exposure may also explain these differences.

Since this study involved children from mostly white, non-Hispanic, and well-educated families, its findings can only be generalized to this group. Investigations of different racial, ethnic, and socioeconomic groups are needed to examine the prevalence of symptoms in other subpopulations. Cross-cultural studies would also be helpful to clarify genetic, dietary, and environmental influences that may contribute to symptoms, perceptions, and management of GER.

In conclusion, GER symptoms are frequent among children. Although the percentage of children complaining about most symptoms of GER is less than 10%, the absolute number of affected children in the community is considerable. Children with symptoms of GER should be examined for possible complications, such as poor growth, respiratory tract problems, food aversion, and esophagitis; furthermore, an assessment should be made about whether these symptoms are interfering with daily

life, such as disrupting play or school. Prospective longitudinal data are needed to determine which children with symptoms of GER actually have GER disease and are at risk of developing complications. Randomized controlled trials are needed to determine the optimum treatment for patients at risk of developing complications of GER and those in whom GER affects quality of life.

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