Objective To determine the prevalence of constipation in children ≤2 years, describe the symptoms of constipation, and review how often specific interventions were effective.

Study design Retrospective chart review.

Results Of 4,157 children <2 years of age, 185 children had constipation. The prevalence rate for constipation in the first year of life was 2.9%, and in the second year of life, the rate was 10.1%. Functional constipation was the cause in 97% of the children. Boys and girls were affected with equal frequency. Constipation was caused by an underlying organic disease in 1.6% of cases, and 97% of the children had functional constipation. Dietary changes and corn syrup were the initial treatment suggestions for 116 children; 93% of these children underwent follow-up examinations, and the constipation resolved in 25% of the children. Of 100 children treated with milk of magnesia or polyethylene glycol 3350 without electrolytes, 93 children underwent follow-up examinations, and the constipation was resolved with treatment in 92% of the children.

Conclusions Dietary changes, corn syrup, or both resolved constipation in 25% of children, and laxatives resolved constipation in 92% of children. Both milk of magnesia and polyethylene glycol were efficient and safe in infants and toddlers. (J Pediatr 2005;146:359-63)

Stool frequency depends on age in children. A number of studies revealed a decline in stool frequency from >4 stools per day during the first week of life to 1.2 per day at 4 years of age, with a corresponding increase in stool size.1-4 Fontana et al. showed that in the first 3 years of life, 97% of healthy children had at least 1 bowel movement (BM) every other day.4 Very little is known about the prevalence of constipation in infants and toddlers. Issenman et al5 reported that 16% of 22-month-old North American children were thought by their parents to be constipated, but it is not clear what definition for constipation was used. Constipation was defined by a group of pediatric gastroenterologists from the North American Society of Gastroenterology and Nutrition (NASPGHAN) as a delay or difficulty in defecation, present for 2 or more weeks and sufficient to cause significant distress to the patient.6 Functional constipation was defined by an international group of pediatric gastroenterologists in infants and preschool children as at least 2 weeks of scybalous, pebble-like, hard stools for most stools, or firm stools 2 or fewer times per week, in the absence of structural, endocrine, or metabolic disease, the ROME II criteria.7

Constipation in infants and toddlers is usually treated first with sorbitol-containing juices, such as prune, pear, and apple, the addition of pureed fruits and vegetables, formula changes, or medication with a high sugar content, such as barley malt extract or corn syrup. If, despite these dietary changes, the stool is still hard and painful to evacuate, then osmotic laxatives, such as lactulose, sorbitol, milk of magnesia, or polyethylene glycol 3350 without electrolytes, are given. The NASPGHAN committee suggested avoiding enemas, mineral oil, and stimulant laxatives because of potential adverse effects in young children.6 The aims of our study were to determine the prevalence of constipation in children 2 years or younger who were seen in our general pediatric clinics, determine the symptoms of constipation in this age group, and review how often dietary changes, corn syrup, or laxatives were effective.
METHODS

Subjects

Between January 2000 and July 2003, a 42-month period, 4,157 children between 0 and 24 months were seen in our general pediatric clinics for health maintenance and acute care visits. This interval was chosen because it allowed follow-up examination of all children. The study was approved by the Institutional Human Research Review Committee.

A computer search using “0 to 24 months” and “constipation,” defined by the ICD codes 564.0, 564.1, 564.2, 564.09 as search terms, identified 215 children, 0 to 24 months of age. We performed a retrospective chart review on all 215 patient records. Twelve children did not have symptoms of constipation reported in their chart for the visit date indicated on the computer printout or on any other of their visits and were excluded. Eighteen well-nourished infants were exclusively breastfed and had long intervals between soft-to-loose BMs (2-14 days; mean, 5.4 ± 3.0 days). This bowel pattern was considered normal in breastfed infants. They did not fit either NASPGHAN6 or ROME II7 criteria for constipation because they had soft-to-loose BMs and no distress. These infants were healthy, had normal growth and development, had no abdominal distention or other symptoms of constipation, and passed soft-to-liquid stools, but infrequently. This left 185 children <2 years of age with constipation for study.

Measures

Data collected included age, duration of constipation, symptoms and signs of constipation such as BM frequency, BM consistency (scale: 1, rock-hard or hard; 2, formed; 3, soft; 4, loose; 5, watery), the presence of pain (reported by the mother as screaming with BMs), stool withholding, blood with BMs, and the presence of rectal impaction or abdominal fecal mass. We evaluated symptoms, duration of constipation, and their relationship to treatment and outcome. Successful treatment was defined as soft-to-formed stool consistency, absence of pain, stool withholding and blood, and no fecal abdominal mass palpable.

Statistical Analysis

Symptoms and data were evaluated for the whole group and for each treatment group. Data obtained in all children during the initial visit were compared with the data obtained during follow-up visits and with similar parameters for the different treatment groups, such as treatment with dietary changes, corn syrup, and laxatives. The statistical analysis included t tests and Chi-square tests with significance accepted at the 5% level. Results were expressed as the mean ± SD or percent.

RESULTS

Prevalence of Constipation

A total of 185 of the 4,157 infants and toddlers had constipation. The prevalence rate for constipation for children ≤2 years of age was 4.45%. The age distribution of these 4,157 children and the prevalence rate by age is given in the Figure. The prevalence rate for constipation in children in the first year of life was 2.9% and was significantly lower than in the second year of life (10.1%; P <.001). The ratio of constipated boys to girls was 1.1:1.

Infant Dyschezia

Ten otherwise healthy infants younger than 6 months had significant discomfort and excessive straining associated with passing soft stools. They exhibited straining and crying for >10 minutes, followed by successful passage of soft stool. These infants fit the NASPGHAN criteria for constipation6; having significant difficulties in defecation and significant distress, they had infant dyschezia. The symptoms improved without intervention in all 10 infants. The data for these 10 infants were not included in the data on symptoms of constipation.

Organic Causes of Constipation

Constipation was caused in only 3 children (1.6%) by underlying organic disease, because of an ovarian tumor in 1 child and because of anal stenosis in the other 2 (a boy who had surgery for Hirschsprung’s disease and a girl who had a low anal atresia with perineal fistula repaired).

Functional Constipation

Most of our constipated infants and toddlers had functional constipation; 166 children (97%) had functional constipation and were otherwise healthy and growing normally. Four children had poor growth: 1 had cartilage-hair hypoplasia, 2 had severe neurologic deficits, and 1 had Down syndrome. Two children had a history of milk protein intolerance as infants; both had bloody loose stools as infants; none had constipation as infant.

Only 132 of the 172 children (77%) met the NASPGHAN or ROME II criteria for functional constipation requiring symptoms for 2 or more weeks. Forty children had <2 weeks of symptoms. As seen in Table I, the children with acute constipation were significantly younger (P <.001), and none had an abdominal fecal mass present, as compared with children with ≤2 weeks of symptoms (P <.02). Otherwise, the symptoms in children with acute constipation (<2 weeks duration) were not significantly different from those in children with constipation lasting ≤2 weeks. Therefore, the symptoms of children with acute and chronic constipation are presented together. The parameters from the history and physical examination of these 172 infants and toddlers (90 boys) are given in Table II.

Treatment and Follow-Up

After the examination of the child, all parents received education, including explanation about the stool-withholding maneuvers, foods that may help in the treatment of constipation, and the benign nature of the constipation. At least 1 more visit to our clinic was accomplished in 155
children (90%) after the initial evaluation to review progress, repeat the examination, and to discuss the treatment plan.

Dietary Changes Including Corn Syrup

The many physicians involved in taking care of these children gave their best advice. If the initial contact was with our nurses via telephone, dietary changes including corn syrup were advised. Dietary changes, corn syrup, or both were the initial treatment in 116 children and for 80% of children with <2 weeks of symptoms; 108 children (93%) returned for follow-up, and constipation resolved in 27 children (25%). Table III gives the initial symptoms of the 72 children treated with dietary changes, corn syrup only, or both. Dietary changes, such as fruit juices, fruits, and vegetables, were the initial treatment in 67 children, but were the only treatment suggestion in 42 children. Sixty-two of 67 children (93%) returned for follow-up. Ten children were treated with a change in formula. Seven of these children returned for follow-up, and constipation had resolved in all of them. Five of the 7 children were switched to a 100% whey-containing formula (Goodstart; Nestlé, Gendale, Calif), and 2 children were switched to soy formula. Thirty-nine children were treated with corn syrup, and in 20 children, it was the only treatment suggestion. Twenty-seven children (69%) returned for follow-up.

Milk of Magnesia and Polyethylene Glycol

One hundred children were treated with milk of magnesia (n = 30) or polyethylene glycol 3350 without electrolytes (MiraLax®, Braintree Laboratories, Braintree, Mass) (n = 70). This group included 44 children in whom prior treatment with dietary changes, corn syrup, or both had failed. Ninety-two of these 100 children were otherwise healthy, 4 were neurologically impaired to devastated, 3 had failure to thrive, and one was receiving soy formula because of cow’s milk protein intolerance. The mean age was 16 months (range, 1-24 months) and the mean duration of constipation was 7 months (range, 4 days-23 months).

As seen in Table III, children treated with milk of magnesia and polyethylene glycol were significantly older (16 ± 6 vs 7 ± 6 months), had a longer duration of constipation (7 ± 7 vs 0.7 ± 1.1 months), were significantly more symptomatic (pain, stool withholding, or blood with BMs, P < .03), and more frequently had an abdominal fecal mass present (16% vs 1%, P < .003) than children treated with dietary changes, corn syrup only, or both.

Daily administration of laxatives, milk of magnesia (range, 0.5-1.8; mean, 1.0 ± 0.4 mL/kg body weight/day), and...
Table III. Comparison of symptoms in children treated with dietary changes versus milk of magnesia and polyethylene glycol without electrolytes (mean ± SD)

<table>
<thead>
<tr>
<th></th>
<th>Treated with dietary changes/corn syrup n = 72</th>
<th>Treated with laxatives n = 100</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (months)</td>
<td>7 ± 6.1</td>
<td>16.1 ± 6.1</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Boys</td>
<td>54%</td>
<td>50%</td>
<td>NS</td>
</tr>
<tr>
<td>Duration of constipation (months)</td>
<td>0.7 ± 1.1</td>
<td>7.1 ± 7.3</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>BM frequency/week</td>
<td>7.1 ± 7.7</td>
<td>5.8 ± 5.6</td>
<td>NS</td>
</tr>
<tr>
<td>BM consistency</td>
<td>1.1 ± 0.4</td>
<td>1.1 ± 0.4</td>
<td>NS</td>
</tr>
<tr>
<td>Hard BMs</td>
<td>93%</td>
<td>93%</td>
<td>NS</td>
</tr>
<tr>
<td>Pain with BMs</td>
<td>27%</td>
<td>51%</td>
<td>&lt; .002</td>
</tr>
<tr>
<td>Fear/withholding with BM</td>
<td>36%</td>
<td>53%</td>
<td>&lt; .03</td>
</tr>
<tr>
<td>Blood with BM</td>
<td>9%</td>
<td>41%</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Rectal impaction†</td>
<td>26% (n=19)</td>
<td>63% (n=68)</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Abdominal fecal mass</td>
<td>1%</td>
<td>16%</td>
<td>&lt; .003</td>
</tr>
</tbody>
</table>

†number of children with a rectal examination are given in parenthesis.

polyethylene glycol 3350 without electrolytes (range, 0.4-1.9; mean, 1.0 ± 0.6 g/kg body weight/day) were the treatments used. Ninety-three children (93%) returned for follow-up visits. Significant improvements in all parameters as compared with the initial data were achieved with laxative treatment. BM frequency/week increased (from 6 ± 6 to 9.4 ± 5.5; \( P < .001 \)), stool consistency improved (from 1.1 ± 0.4 to 2.6 ± 0.8; 4% still had hard BMs; \( P < .001 \)), the percent of children with abdominal pain decreased (from 51% to 3%; \( P < .001 \)), the percent of children with stool withholding decreased (from 53% to 5%; \( P < .001 \)), and the percent of children with blood in the stool decreased (from 41% to 0%; \( P < .001 \)). Laxative treatment was successful in 92% of the children. Both milk of magnesia and polyethylene glycol were efficient and safe. Only one 14-month-old girl refused to take milk of magnesia. Both laxatives were easily administrated by the parent and well accepted by the children.

**DISCUSSION**

We found that the prevalence rate for constipation in children \( \leq 2 \) years of age who attended the general pediatric clinics was 4.5%. The prevalence rate in the first year of life was 2.9%, and in the second year of life it was 10.1%. The ratio of constipated boys to girls was 1.1 : 1. Most of the infants and toddlers who were constipated (97%) had functional constipation. Constipation should not be defined by symptom duration of >2 weeks or by frequency of BMs only, but rather by hard stool consistency and symptoms such as pain with BMs, withholding of BMs, and blood with BMs.

Constipation in early life is a special situation because of the possibility of a serious congenital disorder. Hirschsprung’s disease, involving the rectosigmoid colon, had been diagnosed and treated shortly after birth in 1 infant, 1 patient had low anal atresia with fistula, and in 1 patient the constipation was caused by an ovarian tumor.

The most common cause of constipation in children is an acquired behavior after experiencing a painful defecation. This notion is supported by 93% of the parents in this study reporting hard to rock-hard stools, 27% of the parents reporting having seen blood around their child’s stool, and 42% of children were crying and screaming when passing BMs. Then fear of defecation leads to the voluntary withholding of stool, which is called retentive posturing.\(^8\) Instead of relaxing the pelvic floor for defecation, the retentive child will contract the pelvic floor and gluteal muscles in an attempt to avoid defecation. Infants will often grunt, arch their backs, and stiffen their legs; toddlers often rise on their toes and rock back and forth while stiffening their buttocks and legs, or assume other unusual postures. These maneuvers are often interpreted by parents as straining for defecation. Forty-five percent of the children in this study exhibited stool-withholding behavior. Parents should be counseled to be attentive to painful BMs and taught to intervene quickly to lessen the risk that their child will develop chronic constipation or fecal soiling.\(^9,10\)

Ten otherwise healthy infants younger than six months had significant discomfort and excessive straining and crying for >10 minutes, followed by successful passage of a soft stool. Dyschezia is seen in the first few months of life and can occur several times a day. The symptoms improved without intervention in all children. Parents were reassured about its benign nature and that this phenomenon is part of the child’s learning process, that there is no intervention necessary, and that they should abstain from rectal stimulation.

Hyams et al\(^{11}\) had evaluated the stool characteristics of young healthy infants and found that breastfed infants as a group passed twice as many BMs than infants receiving cow’s milk formulas and that infants receiving soy formula significantly more often had hard/firm stools than breastfed and other formula-fed infants. It is also known that infants who are exclusively breastfed may have infrequent soft bowel movements.\(^ {12}\) One of our breastfed infants did not pass a stool...
for 14 days. One breastfed infant in the literature was reported to have passed a stool only after 26 days.12

Twenty-five percent of children responded to dietary changes including corn syrup. These were children with mild symptoms or acute constipation. The other children needed laxatives for symptom relief. Evidence suggests that 2% and 4% lactulose in formula normalized stool passage and consistency in 90% of 220 infants with functional constipation.13 We used milk of magnesia and polyethylene glycol without electrolytes as laxatives. As we have shown, there is a wide range for dose requirement. After starting at a suggested dose, the optimal laxative dose needed to be established for each child to induce BMs daily that were loose enough to prevent pain, blood, and/or stool withholding. The duration of laxative treatment was determined by the recurrence of symptoms when laxatives were reduced or withdrawn. Both milk of magnesia and polyethylene glycol 3350 without electrolytes were efficient and safe in our infants and toddlers. The safety and efficacy of polyethylene glycol in children <18 months of age was also reported recently by Michail et al.14

It has been reported that cow’s milk protein intolerance is a cause of constipation in young children.15 Intolerance to cow’s milk protein occurs in 0.3% to 7.5% of otherwise healthy infants.16 Symptoms most often include vomiting and diarrhea; occasionally, they include constipation. Four of the 185 infants and toddlers in this study (2%) had cow’s milk protein intolerance. Cow’s milk protein may have been responsible for constipation in 2 of these children (1%).

In summary, constipation is a common complaint in infants and toddlers. Most of the constipated infants and toddlers in this study (97%) had functional constipation. Dietary changes resolved all symptoms of constipation in 25% of the infants and toddlers, and laxatives resolved all symptoms of constipation in 92% of the infants and toddlers.

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**REFERENCES**