

# An Overview of Etiology and Management of Constipation in Children

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**Abstract:** The background, assessment and management of constipation in children is discussed in this review. We conducted search using electronic biomedical databases such as; Medline, and Embase, for studies published up to September 2017 with English language concerning the etiology and management of constipation in children, Following MeSh terms were used in our search strategy: “constipation”, “pediatrics”, “children”, “childhood constipation”. Constipation is quite typical in Asia, and usually of functional origin. Detailed history and appropriate physical examination, including digital rectal examination, can easily distinguish functional from organic constipation. There is no need to do any type of investigation before beginning treatment in functional constipation. Disimpaction with oral polyethylene glycol is the primary step in the management and skipping this step results in refractoriness of constipation. Polyethylene glycol is revealed to be superior to lactulose in the management of constipation. In most cases, long term (months to years) laxative treatment is required and early withdrawal results in recurrence. Radiological colon transit time research study plays an important role in the management of refractory constipation. Slow transit constipation is entirely a different entity and antegrade continence enema aids in this subset of patients.

**Keywords:** constipation in children, oral polyethylene glycol, Radiological colon transit.

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## 1. INTRODUCTION

Constipation is a common problem in children and it accounts for 3% of visits to general pediatric clinics and as many as 30% of visits to pediatric gastroenterologists in developed countries [1]. There is very little information about its prevalence from developing countries. However, some recent reports from south Asia have suggested that it is not uncommon in Asia [2-4]. The common perception in South Asia is that functional constipation is uncommon as diet here is rich in fiber. Hence many children with constipation are subjected to detailed investigations to rule out Hirschsprung disease. However, whatever limited information we have from Asia shows that functional constipation is the commonest type of constipation in Asia as well [2-4].

The background, assessment and management of constipation in children is discussed in this review.

## 2. METHODOLOGY

We conducted search using electronic biomedical databases such as; Medline, and Embase, for studies published up to September 2017 with English language concerning the etiology and management of constipation in children, Following MeSh terms were used in our search strategy: “constipation”, “pediatrics”, “children”, “childhood constipation”. more relevant studies were searched in the references list of included studies.

## 3. DISCUSSION

### • STOOL PATTERN OF NORMAL INFANTS:

Regular variation in feces frequency and consistency typically leads to over-diagnosis of constipation especially in babies. Two recent researches from the Europe (12,984 healthy children, 1-42 months from UK [5] and 600 healthy infants from Netherlands [2] have revealed that the median stool frequency at 1 month old was 3 (0-9) each day and it decreased

dramatically at 3 months of age to 2 (0-6) each day. Moreover, there was a considerable distinction in feces regularity in between breastfed and formula-fed children at 1 month old [4 (0-9) vs. 1 (0-5) each day, specifically,  $P < 0.01$ ] yet there was no distinction at 3 months of age [2 (0-6) vs. 1 (0-5) daily] [5,6]. Another research from Turkey in 911 children aged 0 to 24 months has revealed that the typical defecation frequency at 1 month old was 6 each day and by 4-6 months old it ended up being 1 each day. One of the most intriguing observation of this research study is that the stool regularity was  $< 1$  daily (when in 2-3 days but soft stool) in 39.3% babies in 2-6 months of age [7]. Hence, while taking into consideration constipation we must keep in mind the normal variations of stool frequency and consistency in healthy babies and variations according to their feeding pattern (bust fed versus container fed).

• **DEFINITION OF CONSTIPATION:**

In view of broad variations in feces regularity and uniformity in normal healthy and balanced kids, ROME III criteria [8,9] have consisted of other variables besides frequency of stool to define constipation in youngsters. As each ROME III criteria, useful constipation is defined as existence of two or more of the complying with in absence of any type of organic pathology and the duration need to go to least one month in for a minimum of 2 months in  $\geq 4$  years of age; (i) two or much less defecations each week, (ii) at the very least one episode of fecal urinary incontinence each week, (iii) history of absorbent stance or feces withholding maneuver, (iv) history of unpleasant or difficult defecation, (v) presence of big fecal mass in the anus, (vi) background of retentive posture or feces withholding maneuver is being replaced by background of extreme feces retention as retentive stance is difficult to assess in younger kids.

• **ETIOLOGY AND PATHOPHYSIOLOGY:**

Continence is maintained by uncontrolled and voluntary contraction. The internal anal sphincter has a spontaneous resting tone that decreases when feces goes into the rectum. The outside anal sphincter is under voluntary control. Need to excrete is caused when stool comes right into contact with the mucosa of the lower anus.

If a child does not wish to excrete, she or he tightens the outside anal sphincter and presses the gluteal muscular tissues. These activities could push feces greater in the rectal safe and decrease need to defecate. If a kid often stays clear of excreting, the rectum at some point extends to suit the preserved fecal mass, and the propulsive power of the rectum is lessened.

The longer that feces remains in the rectum, the more challenging it becomes. Passage of a difficult or huge stool might trigger an excruciating anal fissure. The cycle of preventing defecation as a result of an anxiety of unpleasant defecation may advance to stool retention and seldom defecation, a condition that is called practical irregular bowel movements.

Many kids who offer with constipation have useful irregular bowel movements. Seldom, nevertheless, constipation has a severe natural cause. For positive diagnosis of practical constipation, family members physicians must be alert for warning indicators that could suggest the existence of a pathologic condition (Table 1) [10].

**TABLE 1. Warning Signs for Organic Causes of Constipation in Infants and Children**

Warning signs and symptoms	Suggested diagnosis
Passage of meconium more than 48 hours after delivery, small-caliber stools, failure to thrive, fever, bloody diarrhea, bilious vomiting, tight anal sphincter, and empty rectum with palpable abdominal fecal mass	Hirschsprung's disease
Abdominal distention, bilious vomiting, ileus	Pseudo-obstruction
Decrease in lower extremity reflexes or muscular tone, absence of anal wink, presence of pilonidal dimple or hair tuft	Spinal cord abnormalities: tethered cord, spinal cord tumor, myelomeningocele
Fatigue, cold intolerance, bradycardia, poor growth	Hypothyroidism
Polyuria, polydipsia	Diabetes insipidus
Diarrhea, rash, failure to thrive, fever, recurrent pneumonia	Cystic fibrosis
Diarrhea after wheat is introduced into diet	Gluten enteropathy
Abnormal position or appearance of anus on physical examination	Congenital anorectal malformations: imperforate anus, anal stenosis, anteriorly displaced anus

• **ASSESSMENT OF CHILD WITH CONSTIPATION:**

A careful history and complete checkup (consisting of electronic rectal exam) are all that is called for to identify practical constipation offered there are no red flags like fever, vomiting, bloody diarrhea, failing to prosper, rectal stenosis, and limited empty rectum [10]. Abnormal physical findings, which help to distinguish natural sources of constipation from practical, are failure to flourish, lack of lumbo-sacral curve, sacral agenesis, level buttock, anteriorly displaced anus, tight and vacant anus, gush of liquid feces and air on withdrawal of finger, absent anal wink and cremasteric reflex. Features which separate Hirschsprung disease from practical constipation are offered in Table I. The most important functions in the history, which help to differentiate Hirschsprung condition from useful constipation, are beginning in initial month of life and delayed passage of meconium past 48 hours and one of the most vital evaluation searching for is vacant anus on electronic rectal examination. It has been shown that 99% healthy, term neonates and 50% infants with Hirschsprung condition pass meconium in very first 48h of life [11], [12]. In fact, in a classic situation of functional irregular bowel movements, no examination is needed making the medical diagnosis. There is no should do barium enema in all cases of bowel irregularity to rule out Hirschsprung disease. If the clinical uncertainty of Hirschsprung condition is strong (based upon history of delayed flow of meconium and vacant anus on digital rectal examination) after that just one may take into consideration obtaining barium enema done. Nevertheless, to identify Hirschsprung condition, rectal biopsy is a must. The common mistake that leads to further confusion is delayed film (24 hours) revealing retention of barium which is a common searching for in practical irregularity too. The interpretation of barium enema should be on the basis of reversal of rectosigmoid ratio (sigmoid ends up being more dilated compared to anus) and documentation of shift zone and out mere visibility of barium in anus after 24 hours.

• **MANAGEMENT:**

The majority of children with functional constipation get profited from an accurate, efficient treatment plan, that includes cleaning of fecal retention, prevention of additional retention and promo of regular bowel behaviors. The basic method consists of the following actions: (a) establish whether fecal impaction is existing, and deal with the impaction if present, (b) start maintenance therapy with oral laxative, nutritional modification, bathroom training, and (c) close comply with up and drug modification as essential [10]. Recommended technique to constipation is given up Fig. 1.

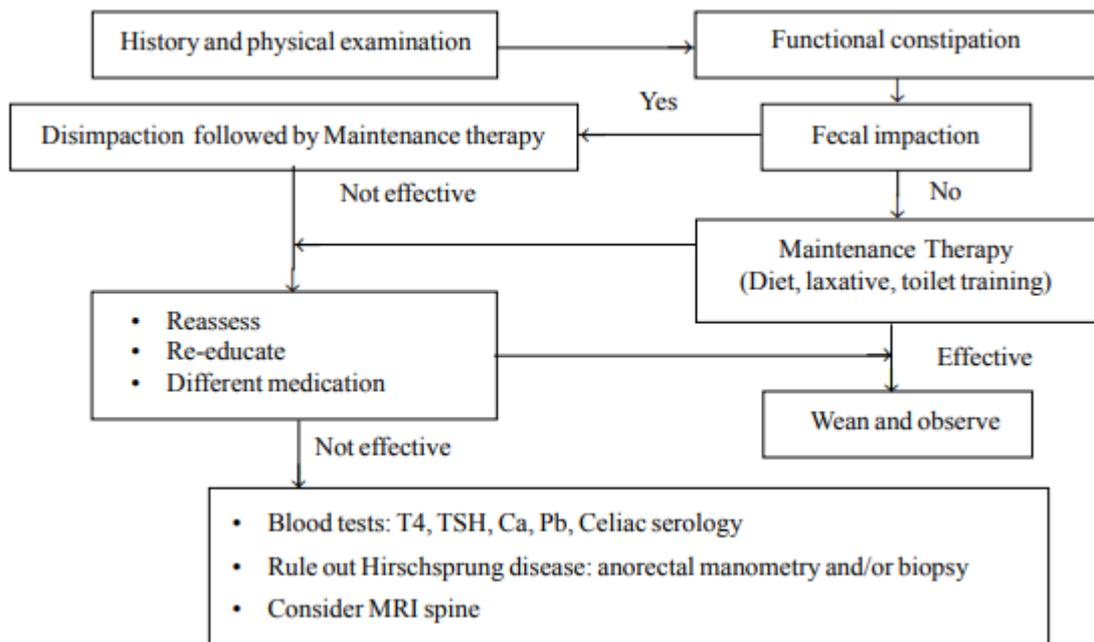


FIG. 1 Suggested approach to functional constipation

**Disimpaction:**

Initial step in the management of constipation is to make a decision whether the youngster has fecal impaction or not. This can be accomplished by abdominal examination (in fifty percent of the instances tough fecal mass or fecalith is apparent in the reduced abdominal area) [13], by electronic rectal evaluation (anus is normally filled with hard stools), or rarely by

abdominal X-ray. Consistently stomach X-ray is not called for to find fecal impaction. However, if the child rejects anal assessment, if he/she is obese, or if there is a doubt about the medical diagnosis of constipation after that only an abdominal X-ray is needed to document excess fecal matter in the colon. If there is fecal impaction (a lot of the children with practical constipation do have), then the very first step in the management is disimpaction, implies clearing or removal of retention from the rectum. This could be attained by oral or by rectal course. Oral course is non-invasive, offers a feeling of power to the kid however compliance is a trouble. Polyethylene glycol (PEG) lavage option is offered by mouth (1-1.5 g/kg/day for 3-6 days) or by naso-gastric tube (25mL/kg/hour, reconstituted PEG remedy) up until clear liquid is eliminated through rectum. Ample disimpaction means both output (stool) and input (lavage option) ought to be of same color in situation of naso-gastric tube disimpaction [10]. Successful disimpaction for homebased program (3-6 days) is defined as either empty or a percentage of soft feces on rectal assessment and resolution of the left lower quadrant mass if it existed [14], [15]. Rectal technique (injection) is faster however invasive, likely to include concern and discomfort that the youngster already has in relation to defecation. This could worsen defecation evasion or retention habits and normally not preferred. However, if PEG is not readily available after that enema could be utilized for disimpaction (salt phosphate injection [proctoclysis]: 2.5 mL/kg, maximum 133ml/dose for 3-6 days) [10]. In a retrospective graph review of 223 children, Guest, et al. [16] have revealed that 97% youngsters treated with PEG were efficiently disimpacted as compared to 73% of those that received enemas and suppositories (P< 0.001). In a randomized regulated trial, Bekkali, et al. [14] have contrasted 6 days enemas with dioctylsulfosuccinate sodium (60 mL in 6 years) in 46 kids with PEG in 44 youngsters and showed that both were just as reliable for disimpaction. Nonetheless, two retrospective researches have revealed that the reimpaction rate after initial disimpaction with enemas was much more compared to that with PEG [16], [17]. For babies, glycerine suppositories are to be made use of for disimpaction as enemas and lavage solution are not shown in them [10].

**Table 2. Therapies for Disimpaction in Children [24],[25].**

Therapy	Dosage
Oral	
Osmotics	
Polyethylene glycol 3350 (Miralax)*	1.5 g per kg per day
Polyethylene glycol solution (Golytely)*	25 mL per kg per hour via nasogastric lavage
Magnesium citrate	< 6 years: 2 to 4 mL per kg per day 6 to 12 years of age: 100 to 150 mL per day > 12 years: 150 to 300 mL per day
Stimulants	
Senna (Senokot)	2 to 6 years of age: 2.5 to 7.5 mL (8.8 mg per 5 mL); ½ to 1 ½ tablets (8.6 mg per tablet) per day 6 to 12 years of age: 5 to 15 mL; 1 to 2 tablets per day
Bisacodyl (Dulcolax)	≥ 2 years: 5 to 15 mg (1 to 3 tablets) per day in a single dose
Lubricants	
Mineral oil	15 to 30 mL per year of age per day
Rectal agents	
Enemas (one per day)	
Saline	5 to 10 mL per kg
Mineral oil	15 to 30 mL per year of age up to 240 mL
Phosphate soda	2 to 12 years of age: 66-mL enema (should not to be used in children < 2 years because of the risk of electrolyte abnormality) > 12 years: 133 mL
Suppository (one per day)	
Bisacodyl	≥ 2 years: 5 to 10 mg (½ to 1 suppository)
Glycerin*	½ to 1 infant suppository; adult suppository for those older than 6 years

**Maintenance therapy:**

To protect against re-accumulation after removing impaction upkeep treatment through nutritional adjustment, toilet training and laxatives has to be begun right away after disimpaction or if there is no impaction, after that as an initial step.

**Dietary modification:** The diet of most children with functional constipation lacks fiber. Most of them are predominantly on milk with hardly any complementary food. The youngsters with functional irregularity must be encouraged to take more liquids, absorbable and nonabsorbable carbohydrate as an approach to soften feces. Non-absorbable carbohydrate (sorbitol) is located in some fruit juices like apple, pear and prune juices. A well balanced diet regimen that consists of entire grains, vegetables and fruits is suggested. The advised daily fiber consumption is age (in years) + 5 in g/day. In our technique, where most children are primarily on milk diet regimen, we guidance the parents to restrict milk to ensure that the youngster begins eating solid foods. Though cow milk healthy protein allergy (CMPA) was proposed as one the usual root causes of constipation [18], subsequent studies [10], [19] and our experience did not substantiate that case.

**Laxatives:** Table II [22] offers the dosages and adverse effects of different laxatives. It has been shown that lactulose, sorbitol, milk of magnesia (magnesium hydroxide), and mineral oil (castor oil), all are similarly efficient in youngsters. Milk of magnesia and mineral oil are disagreeable and as a result of the threat of lipoid pneumonia mineral oil is contraindicated in babies. The generally used laxative in kids until now was lactulose, up until the introduction of PEG. The research study by Loening-Baucke [20] has revealed that low volume (0.5 to 1g/kg/day) polyethylene glycol (PEG) without electrolytes is as efficient as milk of magnesia in the long-term therapy of irregularity in children. Reduced volume PEG has been compared to lactulose in the therapy of youth practical constipation and a meta-analysis of 5 RCTs including 519 kids has revealed that PEG was a lot more efficient compared to lactulose with equivalent tolerability and less adverse effects [23]. Negative effects, specifically bloating and pain are much less with PEG. With long-term use, lactulose loses its efficacy due to alter in digestive tract flora yet PEG does not [24]. The dose of laxative need to be gotten used to have one or two soft stools/day without any kind of discomfort or soiling. When this target is attained, the same dosage must be proceeded for at least 3 months in order to help the distended bowel to regain its function. Indicate be born in mind below is that laxative should be continued for a number of months and in some cases years at the ideal dosage. Early and rapid withdrawal is the commonest reason for reoccurrence. Energizer laxatives (senna, bisacodyl) are not utilized consistently and are contraindicated in babies. They may be made use of for a short program in refractory situations as a rescue treatment [10].

**TABLE 3. Laxatives-dosage and side effects [21]**

Drugs	Dose	Side effects
Lactulose	1-2 g/kg, 1-2 doses	Bloating, abdominal cramps
Sorbitol	1-3 mL/kg/d, 1-2 doses	Same as lactulose
Milk of magnesia	1-3 mL/kg/d, 1-2 doses	Excess use leads to hypocalcemia, hypermagnesemia, hypophosphatemia
PEG for disimpaction	25 mL/kg/hour (R/T) or 1-1.5 g/kg	Nausea, bloating, cramps, vomiting for 3-6 d
PEG for maintenance	5-10 mL/kg/d or 0.4 to 0.8 g/kg/d	Nausea, bloating, cramps, vomiting
Mineral oil for disimpaction	15-30 mL/y of age (max. 240mL)	Lipoid pneumonia, interference with absorption of fat soluble vitamins
Mineral oil for maintenance	1-3 mL/kg/d	Lipoid pneumonia, interference with absorption of fat soluble vitamins
Senna	2-6 yrs: 2.5-7.5 mL/day (8.8 mg/5mL) 6-12 yrs: 5-15 mL/d	Melanosia coli, hepatitis, hypertrophic osteoarthropathy, neuropathy
Bisacodyl	0.5-1 suppository (10 mg)1-3 tabs /dose (5mg)	Abdominal pain, diarrhea, hypokalemia

#### 4. CONCLUSION

Constipation is quite typical in Asia, and usually of functional origin. Detailed history and appropriate physical examination, including digital rectal examination, can easily distinguish functional from organic constipation. There is no need to do any type of investigation before beginning treatment in functional constipation. Disimpaction with oral polyethylene glycol is the primary step in the management and skipping this step results in refractoriness of constipation. Polyethylene glycol is revealed to be superior to lactulose in the management of constipation. In most cases, long term (months to years) laxative treatment is required and early withdrawal results in recurrence. Radiological colon transit time research study plays an important role in the management of refractory constipation. Slow transit constipation is entirely a different entity and antegrade continence enema aids in this subset of patients.

## REFERENCES

- [1] Van den Berg MM, Benninga MA, Di Lorenzo C. Epidemiology of childhood constipation: a systematic review. *Am J Gastroenterol* 2006;101:2401-9.
- [2] Khanna V, Poddar U, Yachha SK. Constipation in Indian children: need for knowledge not the knife. *Indian Pediatr.* 2010;47:1025-30.
- [3] Rajindrajith S, Devanaryana NM, Adhikari C, Pannala W, Benninga MA. Constipation in children: an epidemiological study in Sri Lanka using Rome III criteria. *Arch Dis Child.* 2012;97:43-5.
- [4] Aziz S, Fakhri HAM, Di Lorenzo C. Bowel habits and toilet training in rural and urban dwelling children in a developing country. *J Pediatr.* 2011;158:784-8.
- [5] Steer CD, Emond AM, Golding J, Sandhu B. The variation in stool patterns from 1 to 42 months: a population based observational study. *Arch Dis Child.* 2009;94:231-4.
- [6] den Hertog J, van Leengoed E, Kolk F, van den Broek L, Kramer E, Bakker E, et al. The defecation pattern of healthy term infants up to the age of 3 months. *Arch Dis Child Fetal Neonatal Ed.* 2012;97:F465-F470.
- [7] Tunc VT, Camurdan AD, Ilhan MN, Sahin F, Beyazova U. Factors associated with defecation patterns in 0 to 24 months old children. *Eur J Pediatr.* 2008;167:1357-62.
- [8] Hyman PE, Milla PJ, Benninga MA, Davidson GP, Fleisher DF, Taminiou J. Childhood functional gastrointestinal disorders: neonate/ toddler. *Gastroenterology.* 2006;130:1519-26.
- [9] Rasquin A, Di Lorenzo C, Forbes D, Guiraldes E, Hyams JS, Staiano A. Childhood functional gastrointestinal disorders: child/adolescents. *Gastroenterol.* 2006; 130:1527-37.
- [10] Tabbers MM, Di Lorenzo C, Berger MY, Faure C, Langendam MW, Nurko S, et al. Evaluation and treatment of functional constipation in infants and children: evidence-based recommendations from ESPGHAN and NASPGHAN. *J Pediatr Gastroenterol Nutr.* 2014;58:258- 74.
- [11] Metaj M, Laroia N, Lawrence RA, Ryan RM. Comparison of breast- and formula-fed normal new born in time to first stool and urine. *J Perinatol.* 2003;23 624-8.
- [12] Jung PM. Hirschsprung's disease: one surgeon's experience in one institution. *J Pediatr Surg.* 1995;30:646-51.
- [13] Loening-Baucke V. Factors determining outcome in children with chronic constipation and fecal soiling. *Gut.* 1989;30 999-1006.
- [14] Bekkali N, van den Berg MM, Dijkgraaf MGW, van Wijk MP, Bongers MEJ, Liem D, et al. Rectal fecal impaction treatment in childhood constipation: enemas versus high doses oral PEG. *Pediatric.* 2009;124:e1108-e115.
- [15] Youssef NN, Peters JM, Henderson W, Shultz-Peters S, Lockhart DK, Di Lorenzo C. Dose response of PEG 3350 for the treatment of childhood fecal impaction. *J Pediatr.* 2002;141: 410-4.
- [16] Guest JF, Candy DC, Clegg JP, Edwards D, Helter MT, Dale AK, et al. Clinical and economical impact of using macrogol 3350 plus electrolytes in an outpatient setting compared to enemas and suppositories and manual evacuation to treat pediatric fecal impaction based on actual clinical practice in England and Wales. *Curr Med Res Opin.* 2007;23:2213-25.
- [17] Freedman SB, Thull-Freedman J, Rumantir M, Eltorki M, Schuh S. Pediatric constipation in the emergency department: evaluation, treatment and outcomes. *J Pediatr Gastroenterol Nutr.* 2014;59:327-33.
- [18] Iacono G, Cavataio F, Montalto G, Florena A, Tumminello M, Soresi M, et al. Intolerance of cow's milk and chronic constipation in children. *N Engl J Med.* 1998;339:1100-4.
- [19] Simeone D, Miele E, Boccia G, Marino A, Troncone R, Staiano A. Prevalence of atopy in children with chronic constipation. *Arch Dis Child.* 2008;93:1044-7. 26. Loening-Baucke V. Polyethylene glycol without electrolytes for children with constipation and encopresis. *J Pediatr Gastroenterol Nutr.* 2002;34:372-7.
- [20] Lowery SP, Srour JW, Whitehead WE, Schuster MM. Habit training as treatment of encopresis secondary to chronic constipation. *J Pediatr Gastroenterol Nutr.* 1985;4:397-401.

- [21] Baker SS, Liptak GS, Colletti RB, Croffie JM, Di Lorenzo C, Ector W, et al. Clinical practice guideline: Evaluation and treatment of constipation in infants and children: recommendations of the North American Society of Pediatric Gastroenterology and Nutrition. *J Pediatr Gastroenterol Nutr.* 2006;43:e1-e13.
- [22] Candy D, Belsey J. Macrogol (polyethylene glycol) laxatives in children with functional constipation and fecal impaction: a systematic review. *Arch Dis Child.* 2009;94:156-60.
- [23] Candelli M, Nista EC, Zocco MA, Gasbarrini A. Idiopathic chronic constipation; pathophysiology, diagnosis and treatment. *Hepatogastroenterol.* 2001;48:1050-7.
- [24] Tabbers MM, Di Lorenzo C, Berger MY, et al. Evaluation and treatment of functional constipation in infants and children: evidence-based recommendations from ESPGHAN and NASPGHAN. *J Pediatr Gastroenterol Nutr.* 2014;58(2):265–281.
- [25] Biggs WS, Dery WH. Evaluation and treatment of constipation in infants and children. *Am Fam Physician.* 2006;73(3):469–477.