

Functional Constipation in Children

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1. Introduction

Functional constipation is a common pediatric condition worldwide that significantly impacts the social, physical, and emotional development of children and their parents. It is a clinical diagnosis based on the Rome IV criteria. Non-pharmacological management includes education, dispelling myths, lifestyle recommendations, and toilet training. Pharmacological treatment involves disimpaction, maintenance therapy, and, whenever possible, gradual dose reduction. Polyethylene glycol is considered the first-line agent for both disimpaction and maintenance therapy. Alternative pharmacological options include various osmotic laxatives, stimulant laxatives, lubricants, and enemas. While new drugs are emerging, data supporting their widespread use in pediatrics are often insufficient, highlighting the need for higher-quality research in this area. If symptoms persist despite optimal pharmacological treatment, botulinum toxin injections into the anal sphincter may be considered as an alternative, more invasive treatment modality. This review presents current information on the pharmacological management of functional constipation in children. If symptoms persist despite non-pharmacological interventions, osmotic laxatives are added to the treatment regimen. However, a significant proportion of patients continue to experience symptoms despite pharmacological treatment. Studies conducted in secondary and tertiary care settings indicate that 40% of treated children continue to have symptoms for 6–12 months [1]. Furthermore, laxatives can cause various adverse effects, such as fecal incontinence, flatulence, abdominal pain, and nausea [2]. Consequently, new pharmacological agents are constantly being introduced, and their efficacy and safety are continually being evaluated. In this article, we present an updated review of the currently available literature on the pharmacological treatment of functional diarrhea in children. Aspects related to the diagnosis and non-pharmacological treatment of functional diarrhea are briefly discussed.

1.1. How is Functional Chronic Constipation Defined?

Constipation is characterized by a reduction in the normal frequency of bowel movements, painful defecation, the passage of hard stool, and/or a sensation of incomplete

bowel emptying. In 90–95% of cases, it is a functional gastrointestinal disorder unrelated to any systemic cause or anatomical defect. Currently, functional constipation is defined according to the Rome criteria—specifically, the latest version, Rome IV. This version distinguishes between toilet-trained and non-toilet-trained children. For toilet-trained children, additional criteria are assessed, such as the occurrence of fecal incontinence episodes and a tendency to pass hard stool that may clog the toilet. Indeed, episodes of fecal incontinence are not characteristic of children who are not toilet-trained. Assessing stool consistency is crucial for evaluating a child's bowel habits when diagnosing functional constipation. The most widely used visual tool is the Bristol Stool Form Scale, which comprises seven descriptions of stool types—ranging from hard to watery—accompanied by illustrations. It is included in the Rome IV questionnaire for children over the age of four. Its reliability for younger, non-toilet-trained children has been a subject of debate; consequently, a different visual scale—the Brussels Infant and Toddler Stool Scale—was developed for this patient population. Although the Rome criteria provide a clear definition of functional constipation, there is no universally accepted definition of refractory constipation in pediatrics. This condition has never been officially defined or standardized; it is generally characterized by a failure to respond to maximal laxative therapy and/or the need for daily rectal stimulation (via enemas or suppositories) for a period exceeding three months. In such patients, it is essential to carefully assess treatment adherence and rule out secondary causes of constipation before proceeding to more invasive treatment methods, including new pharmacological agents not yet approved for pediatric use.

1.2. What is the Prevalence?

Heterogeneity among studies regarding population samples, diagnostic criteria, and the ethnicity and background of participants makes it impossible to determine the true prevalence of functional constipation. Conducted a systematic review of the epidemiology of functional constipation in children based on the pediatric Rome III and Rome IV criteria; they reported a global prevalence of 9.5% according to the Rome III criteria [2,3]. Epidemiological

studies using the Rome IV criteria were not included in this systematic analysis. These results were consistent with an earlier systematic review by which included 17 studies on the prevalence of functional constipation in children; these studies reported a range of 0.7% to 29.6%, with a median of 12%. However, the authors included studies that employed various diagnostic criteria for constipation, ranging from self-reporting to the Rome II and III criteria et al [4]. A similar global prevalence of constipation (14.4%) was found when analyzing only those studies conducted using the most recent Rome IV criteria [5]. Confirming this, Russo et al. (2019) found no statistically significant difference in the prevalence of functional dyspepsia between the Rome III and Rome IV criteria (17.3% vs. 18.2%, $p = 0.8$) [6]. In conducted a study involving 740 Italian children to assess the prevalence of functional gastrointestinal disorders et al. Functional dyspepsia was the most common disorder, with a prevalence of 18.2% according to the Rome IV criteria; it was more common in children than in adolescents [7]. Another study conducted in Italy showed a similar prevalence of functional dyspepsia (16.1%) among children aged 13 to 48 months [8]. Overall, functional dyspepsia can be considered a common problem in children: up to 25% of visits to pediatric gastroenterologists and 3% of all outpatient pediatric consultations are related to functional dyspepsia [9].

1.3. What is the etiology?

The etiology remains unknown but appears to be multifactorial; genetic factors, lifestyle factors (such as diet and physical activity), and psychological disorders are likely involved. In particular, alterations in rectal and pelvic floor function along the brain-gut axis appear to play a crucial role [10]. The primary pathophysiological mechanism, especially in young children, is stool retention. The retention of fecal matter in the rectum leads to water absorption by the rectal mucosa, resulting in the formation of hard, lumpy stool. This process creates a vicious cycle of difficult defecation. Furthermore, if a large amount of fecal matter is retained in the rectum, the rectal wall can become increasingly distended, leading to fecal incontinence and a loss of rectal sensation and the normal urge to defecate [11,12]. Stool retention may result from a prior painful or hard bowel movement—exacerbated by a history of anal fissures—or from anxiety about using the toilet due to unpleasant environmental conditions, or even voluntary avoidance due to a lack of interest [13]. Changes in daily routine or diet, weaning, stressful situations, starting preschool, comorbidities, and even school attendance can aggravate the problem [14]. Regarding sociodemographic factors, data on the association between gender and constipation are inconsistent. Some studies have found a slightly higher prevalence of constipation among girls [15,16], whereas others have shown similar prevalence rates between boys and girls [17]. A 2018 meta-analysis found no association between gender and the risk of developing functional constipation, nor between gender and age [18]. The prevalence of functional constipation appears to be linked to geographic location: the highest rates are observed in the Americas and Europe rather than in Asia [18]. The higher prevalence of constipation in Western countries may be attributed to cultural differences (lifestyle,

environment, toilet type, etc.) that could play a role in the pathophysiology of functional constipation. The disparity in constipation prevalence between the East and the West may stem from the fact that Asian cuisine is richer in fiber than most Western diets, as well as differences in defecation posture. In Asian countries, people most often defecate in a squatting position, whereas most Westerners use a seated toilet, which alters the anorectal angle [19]. However, this finding may also be due to a lack of epidemiological studies in other regions of the world [20]. It is generally believed that a low-fiber diet contributes to constipation; however, there is still no consensus on this matter in the scientific literature [21]. Although several pediatric studies have identified a link between low fiber intake and the development of constipation [22–24], other studies have found no such association [25]. De Carvalho et al. found no link between low dietary fiber intake and constipation [26]. Similarly, a study involving Japanese children found that fiber intake was lower in the group with functional constipation than in the group without it; however, binomial logistic regression analysis revealed no correlation between fiber intake and functional constipation [27]. However, the majority of children who do not suffer from constipation do not consume the recommended amount of fiber. Early-life nutrition also influences functional constipation; breast milk has been reported to be a protective factor [29]. Confirmed a potential link between breast milk consumption and childhood constipation, concluding that exclusive breastfeeding during the first six months of life protects against constipation by influencing stool consistency—both in early life and later on—through epigenetic mechanisms and/or behavioral pathways [30].

Recent data suggest that functional constipation may result from alterations in the gut microbiota and the microbiota-gut-brain axis. Consistent with the gut-brain axis theory, adverse psychosocial factors (such as stressful life events or low quality of life) appear to be associated with a higher prevalence of functional constipation. Infant gut microbiota composition depends on the mode of delivery [31], and Cesarean section has been linked to an increased risk of functional constipation [32–34]. Finally, family history is another confirmed risk factor [35–37]. In published the results of a family study involving children with and without functional constipation. The prevalence of constipation among first-degree relatives of probands was significantly higher than in the control group (30% vs. 7% for siblings and 42% vs. 9% for parents; $p = 0.009$ and $p < 0.001$, respectively) [38]. Twin studies have shown that childhood constipation is attributable to genetic predisposition in 59% of cases, although no specific gene mutations directly linked to constipation have yet been identified.

1.4. Classification

Functional constipation, which lacks an organic cause, is the most common type of constipation in children and adolescents, accounting for 95% of cases. In only 5% of cases is constipation in children and adolescents associated with conditions such as Hirschsprung disease, cystic fibrosis, Down syndrome, anorectal malformations, neuromuscular

disorders, spinal cord anomalies, or celiac disease [39]. Certain medications, such as opiates, antacids, and anticholinergics, can also cause constipation [39]. Functional constipation is classified as a functional gastrointestinal disorder that cannot be explained by structural or biochemical abnormalities [40]. Other functional gastrointestinal disorders in children that may be associated with constipation include infant dyschezia and fecal incontinence without retention. Infant dyschezia occurs in infants under nine months of age and presents with symptoms resembling constipation—such as straining, crying, and brief facial flushing—yet the stool remains soft. These symptoms resolve spontaneously and are typically associated with a lack of coordination in the anal sphincter muscles. Fecal incontinence without retention differs from functional constipation by the presence of fecal incontinence without fecal impaction, a normal frequency of bowel movements, and normal colonic transit time in children aged four to 18 years. Children with fecal incontinence may exhibit significant psychosocial problems or neurological disorders. Although encopresis is not mentioned in the Rome IV criteria for diagnosing constipation, it is included in the *Diagnostic and Statistical Manual of Mental Disorders*, 5th Edition (DSM-5), as an elimination disorder that can occur with or without fecal retention. Encopresis is the repeated passage of feces in inappropriate places (such as on clothing or the floor), with one or more such incidents occurring monthly for three or more months, and the key feature being the soiling of clothing.

1.5. What are the Signs and Symptoms of Functional Constipation?

Symptoms of functional constipation include difficult and infrequent bowel movements, often accompanied by abdominal bloating and pain [41]. Functional constipation was the cause of acute abdominal pain in 50% of children seeking primary medical care, and it should be considered during diagnosis [42]. Children with functional constipation often experience fecal incontinence—the involuntary passage of stool into underwear after toilet training has been achieved. This occurs because soft stool leaks past hard fecal masses retained in the rectum. Fecal incontinence is more common in children with functional constipation than in those without it [43,44]. According to a US study involving children aged 4 to 7 years, fecal incontinence was observed in 4.4% of the children; of these, 95% had functional constipation.

The rectum and the urinary tract are anatomically close and share innervation, which may explain how dysfunction in one system affects the other [45]. Consequently, children with functional constipation often exhibit urinary tract abnormalities, such as urinary incontinence and urinary tract infections [46]. The link between chronic functional constipation and acute urinary retention may stem from chronic rectal distension, which leads to irritation of the bladder trigone, invagination of the posterior bladder wall, and urethral obstruction [47]. Loening-Baucke investigated the impact of treating functional constipation on urological symptoms.

1.6. What are the Examination Findings in Constipation?

1.6.1. Palpable fecal masses

Palpable fecal masses are a common finding and are easily felt in young children, who have thin abdominal walls. They are best detected by placing the child on their back, positioning the examining hand over the left iliac fossa, and "rolling" the mass beneath the hand. These masses have a characteristic indented shape and are mobile, as they are located within the movable sigmoid colon. Palpable fecal masses indicate moderate constipation; however, their absence does not rule out the condition.

1.6.2. Perianal examination

The perianal area should be inspected for anal fissures, skin rashes, abnormal anal positioning, anal fistulas, anal stenosis, and the absence of the anal reflex. The examination is best performed with the child lying on their side, with hips and knees flexed, and with a parent present to help soothe the child. Digital rectal examination is psychologically traumatic for children and, if performed incorrectly, can cause physical injury in young children. If the medical history supports the diagnosis, a rectal examination is not required to diagnose constipation.

1.7. Behavioral Interventions

Children with chronic constipation have lower quality-of-life scores than those without the condition. Children with functional constipation may experience shame, peer rejection, bullying, and recurrent treatment failures. Adolescents with functional constipation are at increased risk for depression, anxiety, somatic symptoms, social withdrawal, and social difficulties. Current evidence does not support the efficacy of intensive behavioral therapy or biofeedback in treating functional constipation. However, minor behavioral modifications—such as structured toilet training using a reward system that encourages the child to have a bowel movement after every meal—can prevent the recurrence of fecal impaction. Some studies indicate that combining pharmacological treatment with behavioral therapy can improve fecal incontinence and other clinical symptoms. Clinicians should consider referring children with functional constipation to a pediatric psychologist, particularly if normal bowel habits are not restored within three months of starting treatment. Clinicians should also consider the potential negative impact of functional constipation on the child's parents or caregivers. Parents of children with constipation report unmet needs, including a lack of knowledge regarding medication use, feelings of isolation, a sense of being blamed for the child's condition, distress over ineffective treatment, and perceived dismissiveness from healthcare providers.

1.8. Removal of Fecal Blocks

For children with fecal impaction, the first step in treating constipation is removing solid stool from the colon. Fecal impaction can be diagnosed by such signs as involuntary defecation, the presence of a palpable fecal impaction during palpation of the abdomen or hard fecal masses in the dilated rectum during digital rectal examination. Fecal impaction can be relieved with oral or rectal medications. Polyethylene

glycol (Miralax) is a polymer that is practically not absorbed in the gastrointestinal tract, which leads to water retention in the intestines and softening of the stool. Polyethylene glycol is a first-line drug because it is more effective than other agents for the removal of fecal impactions and maintenance therapy, is well tolerated and has a low risk of side effects. To eliminate obstruction, 1 to 1.5 g of polyethylene glycol per 1 kg of body weight, diluted in 180-240 ml of water or juice, is prescribed daily for two to six days. Other oral agents are second-line treatments.¹² The North American Society of Pediatric Gastroenterology, Hepatology, and Nutrition recommends an enema once daily for three to six days as second-line therapy if polyethylene glycol is not available. Enemas are not indicated for infants, so glycerin suppositories are often used. If bowel movements at home are unsuccessful, hospitalization is necessary to administer polyethylene glycol through a nasogastric tube. Treatment begins with 10 ml per kg body weight per hour and increases the dose by 10-20 ml every 1-2 hours to a maximum of 40 ml per kg body weight per hour. Digital fecal removal is rarely used and carries a risk of colon perforation.

1.9. What are the Most Common Mistakes?

Constipation cannot be ruled out simply because a child has daily bowel movements. It may appear that the child has regular bowel movements due to (a) misleading reports from the child, (b) spurious diarrhea, or (c) incomplete bowel emptying. Incomplete emptying is usually functional in nature, as the child wants to return to playing as quickly as possible. Moreover, laxatives alone do not solve the problem. As detailed in this article, behavioral modification combined with the use of osmotic laxatives is the cornerstone of successful treatment for chronic constipation. Over-suspicion of Hirschsprung disease is another potential pitfall for the physician. Classic Hirschsprung disease is rare (occurring in one per 10,000 live births) and is typically diagnosed in newborns or infants presenting with infrequent stools, vomiting, severe abdominal distension, or sepsis. Ultra-short-segment Hirschsprung disease is rare, and its diagnostic criteria are controversial. While it is important to inquire about a history of delayed meconium passage, a physician should not diagnose ultra-short-segment Hirschsprung disease in the absence of vomiting or abdominal distension. Copious, hard stools are an unusual finding in true Hirschsprung disease. Furthermore, many mothers cannot recall whether their child passed meconium on the first day of life; this does not imply that the child has Hirschsprung disease. In the local setting, most infants are born in maternity hospitals, and local nurses are well-trained to monitor for delayed meconium passage. Finally, diagnosing most cases of constipation does not require any diagnostic tests. Obtaining a supportive medical history and performing a physical examination are sufficient.

1.10. What is the Long-Term Prognosis?

The prognosis for functional constipation (FC) in children was evaluated in a systematic review comprising 14 heterogeneous prospective follow-up studies involving a total of 1,752 children. The review reported that half of the children treated for FC recovered and discontinued

laxative use after 6–12 months of follow-up. Another 10% remained symptom-free while taking laxatives. After follow-up periods of 1–2 years and 5–10 years, recovery rates were 58% and 56%, respectively. Recovery rates were higher among children treated by pediatric gastroenterologists compared to those treated by general pediatricians. Although these three steps may seem simple, the challenge lies in ensuring that parents or caregivers carry them out daily. Treating chronic constipation requires dedication and consistency from parents or caregivers. While certain parental duties can be delegated—such as to a housekeeper, grandparent, or childcare provider—responsibility for the child's health remains with the parents; they must coordinate care and ensure consistency among caregivers regarding any behavioral interventions. Other useful home-care tips include: (a) using a footstool or a child-sized toilet seat insert for young children whose feet do not reach the floor; (b) training the child to sit on the toilet (under direct parental supervision); (c) encouraging the child to drink more water daily; and (d) ensuring the child eats more fruits and vegetables for their fiber content. and (e) increasing the child's physical activity to improve bowel motility.

1.11. Second Stage of Treatment: Pharmacological Treatment

Medications can be used—in conjunction with behavioral changes—to address the "constipation" and "pain" that form a vicious cycle. Although medications alone cannot ensure long-term treatment success, they are important for ensuring that the stool remains soft enough to pass without pain.

1.11.1. Osmotic laxatives

Osmotic laxatives (e.g., lactulose, polyethylene glycol) are preferred over stimulant laxatives (e.g., senna, bisacodyl) because (a) osmotic laxatives are well-tolerated over the long term; (b) many stimulant laxatives are not approved for use in young children; and (c) reliance on stimulant laxatives can lead to behavioral issues, preventing long-term treatment success. Osmotic laxatives soften the stool and facilitate its passage. They do not act instantly, as the medication requires time to travel through the entire intestine to reach the distal colon, and the dosage often needs to be increased over several days. Laxatives should be administered daily until the child has regular, soft stools (Bristol Stool Form Scale type 4) and has overcome the fear of defecation. At this stage, laxative use can be gradually tapered off—for example, by reducing the dose or administering the medication every other day. Physicians often prescribe osmotic laxatives in the following ways: (a) only on an as-needed basis; (b) for a short course; or (c) at insufficient doses due to a fear of causing diarrhea. Unfortunately, constipation tends to recur because the vicious cycle remains unbroken. The duration of laxative use required to break the vicious cycle is at least a couple of weeks or even months—rather than days—and must be proportional to the duration of the constipation, as the rectum needs time to regain its normal size and contractile function.

1.11.2. Non-Pharmacological Treatment

Non-pharmacological treatment is the first step in managing functional constipation (FC). ESPGHAN/NASPGHAN guidelines recommend normal fiber and fluid intake, as well as normal physical activity, combined with education and demystification. Toilet training complements treatment for children with a developmental age of at least 4 years. Both patients and parents should be informed about the pathophysiology of FC and the associated fecal incontinence. Several additional non-pharmacological treatments are available. A recent systematic review and meta-analysis analyzed existing data and demonstrated that abdominal electrical stimulation, *Cassia* fistula emulsion, and a cow's milk-free diet can be effective in increasing bowel movement frequency. Other non-pharmacological treatments—such as prebiotics and probiotic supplements, synbiotics, biofeedback, massage, and alternative medicine—have not shown significant improvement in bowel movement frequency.

2. Conclusion

In summary, functional constipation in children remains one of the most pressing and multidisciplinary issues in modern pediatrics. The high prevalence of this condition and its tendency to become chronic require the practicing physician to have a clear understanding of diagnostic criteria (Rome IV criteria) and to timely rule out organic causes of the disease ("red flag symptoms").

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