Yüksek İhtisas Üniversitesi
Sağlık Bilimleri Dergisi
Yüksek İhtisas University Journal of Health Sciences
ISSN 2717-8439
E-ISSN 2717-9257

YIU Saglik Bil Derg 2025;6(3):138–143
https://doi.org/10.51261/yiu.2025.1773829

DERLEME MAKALESİ / REVIEW ARTICLE

Complementary Nutrition and Alternative Nutritional Therapies in Functional Constipation in Children

Çocuklarda Fonksiyonel Kabızlıkta Tamamlayıcı Beslenme ve Alternatif Beslenme Tedavileri

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ABSTRACT

Introduction: Functional constipation observed in childhood is a gastrointestinal problem that is common worldwide and negatively affects quality of life. In addition to medical treatment approaches, the use of laxatives and behavioral therapies play a role in reducing symptoms. However, parents often turn to alternative treatments for their children, especially when there is a risk of side effects, duration, or inadequacy of the treatments applied. One such alternative treatment is nutritional therapy. Nutritional therapy plays an effective role in conjunction with medical treatment or without medical treatment by enabling improvements in an individual's eating habits. This review examines various complementary and alternative dietary methods used in the management of functional constipation in children.

Conclusion: The literature contains findings indicating that approaches such as increasing fiber intake, probiotic supplementation, elimination of cow's milk, and plant-based preparations with laxative effects (e.g., Cassia fistula emulsion and Descurainia sophia seeds) contribute to symptom improvement. However, evidence regarding the reliability and effectiveness of these alternative treatments is limited. An increase in randomized controlled studies with larger samples will contribute to the literature in terms of effectiveness and reliability.

Keywords: Alternative nutritional therapy, childhood functional constipation, complementary feeding

ÖZ

Giriş: Çocukluk döneminde gözlenen fonksiyonel kabızlık dünya çapında sık rastlanan ve yaşam kalitesini olumsuz etkileyen gastrointestinal bir sorundur. Bu sorunla mücadelede tıbbi tedavi yaklaşımlarının yanında laksatif kullanımı ve davranışsal tedaviler semptomları azaltmada rol oynar. Ancak uygulanan tedavilerin yan etki riski, süresi, yetersizliği gibi durumlarda özellikle ebeveynler çocukları için alternatif tedavilere yönelirler. Bu alternatif tedavilerden biri de beslenme tedavisidir. Beslenme tedavisi, bireyin beslenme alışkanlıklarında iyileşmelere olanak sağlayarak tıbbi tedaviyle birlikte veya tıbbi tedavi olmaksızın etkin bir rol üstlenir. Bu derlemede, çocuklarda fonksiyonel kabızlık yönetiminde kullanılan çeşitli tamamlayıcı ve alternatif beslenme yöntemleri incelenmiştir.

Sonuç: Literatürde posa tüketiminin artırılması, probiyotik takviyesi, inek sütü eliminasyonu, bitkisel kaynaklı laksatif etki gösteren preparatlar (örn. *Cassia fistula* emülsiyonu ve *Descurainia sophia* tohumları) gibi yaklaşımların semptom iyileşmesine katkı sağladığına dair bulgular bulunmaktadır. Fakat bu alternatif tedavilerin güvenilirliği ve etkinliğine dair kanıtlar sınırlıdır. Bunlara yönelik daha geniş örneklemle yapılan randomize kontrollü çalışmaların artması etkinlik ve güvenilirlik açısından literatüre katkı sağlayacaktır.

Anahtar Sözcükler: Alternatif beslenme tedavisi, çocukluk çağı fonksiyonel kabızlık, tamamlayıcı beslenme

Cite this article as: Kılıç N, Gençgil Demir E. Çocuklarda Fonksiyonel Kabızlıkta Tamamlayıcı Beslenme ve Alternatif Beslenme Tedavileri. YIU Saglik Bil Derg 2025;6(3):138–143. https://doi.org/10.51261/yiu.2025.1773829

Introduction

The prevalence of functional constipation (FC), which is commonly observed in children and adolescents worldwide, is 9,5% (1). More than 90% of constipation cases in children are caused by FC (2). The remaining part of constipation cases in children and adolescents are due to diseases attributable to an underlying cause, such as cystic fibrosis, Hirschsprung disease, anorectal malformations, neuromuscular disorders, Down syndrome, celiac disease or spinal cord abnormalities (3). Functional constipation, which has multiple causes, is considered a gastrointestinal disorder (4). Among functional gastrointestinal disorders, conditions such as infantile dyschezia (difficulty in defecating) and fecal incontinence (lack of control over defecation) may also be related with constipation during

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Geliş Tarihi/Received: 29.08.2025, **Kabul Tarihi/Accepted:** 20.10.2025, **Çevrimiçi Yayın Tarihi/ Available Online Date:** 19.12.2025

childhood. Infant dyschezia is observed in infants under nine months of age and is characterized by constipation-like symptoms, including crying, straining, and transient facial flushing, despite the frequent passage of soft stools. These symptoms, which recover spontaneously, are usually caused by a dysfunction of the anal sphincter muscles. Non-retentive fecal incontinence is defined as difficulty controlling bowel movements and is distinguished from FC by the occurence of fecal incontinence in the absence of fecal impaction (impacted fecal mass located in the colon and rectum) in children between the ages of four and 18, normal stool count and normal colonic transit time. Children with non-retentive fecal incontinence may have significant psychosocial problems or neurological lesions (3,5). Functional constipation causes complaints such as delayed defecation and/or painful defecation, fecal incontinence and abdominal pain. Therefore, it can cause significant problems for the child and the family. Also, there is a significant impact on healthcare services (6). In this review, the effectiveness of alternative nutrition and complementary nutrition therapies applied to alleviate the disease burden of FC on both the child and the parents was examined based on the current literature. The role of probiotics, fiber-enriched diets, and functional foods in managing pediatric constipation, this review aims to provide an updated synthesis of current evidence and highlight potential directions for clinical practice and research. In this review, information in the existing literature was scanned with the keywords 'functional constipation in children, diagnosis and treatment methods, alternative treatment method, complementary feeding' .

Normal Bowel Pattern

Normal bowel movements depends on the age of the child and decrease as they get older. In the first week of life, a baby has an average of four bowel movements per day. By age two, the average frequency approaches two bowel movements per day. The frequency of bowel movements at four years of age is similar to the adult pattern (from three times a day to three times a week) (7–9). Exclusively breastfed babies are an exception to this pattern because they can normally have several days between bowel movements. If the stool consistency is soft, this should not be considered constipation (10).

Mechanism and Risk Factors of Functional Constipation

Functional constipation can usually reveal during times of dietary change (transition to solid foods, weaning from breast milk to infant formula or cow's milk, fiber deficiency, etc.), illness or dehydration, toilet training, stressful events and school start (11). Constipation that occurs during these periods leads to painful bowel movements. This situation may also cause the child to hold back their stool. Holding stool increases the absorption of water from the colon, making the stool harder and more difficult to pass. The child contracts the anal sphincter and gluteal muscles, stiffening his/her body to avoid the next painful bowel movement (8). Children may exhibit behaviors such as hiding in a corner, repetitive rocking movements, or increased restlessness in response to the urge to defecate. These withholding behaviors are often mistaken by parents for purposeful straining related to bowel movements. With time, children develop fecal incontinence due to overflow caused by the distension and desensitization of the rectum due to fecal impaction (8,11). In addition, fecal accumulation in the rectum causes decreased gastric emptying, resulting in abdominal bloating, loss of appetite, abdominal pain and nausea. While children may experience painful or traumatic experiences during defecation and may exhibit stool retention behavior, the desire to defecate is suppressed as a learned behavior in children during adolescence (5,12).

Diagnosis and Treatment of Functional Constipation

In FC, a targeted history and physical examination are necessary for diagnosis. Questioning the age at which constipation first began and the conditions under which it occurred are elements that will help in making the diagnosis (7). At the same time, when taking the patient's history, it is important to learn about medication use, eating habits, social history and family, frequency of stressful life events such as sexual abuse, school problems, parental divorce, death in the family, and whether the child has a history of treatment for constipation (13). A thorough physical examination serves as a fundamental yet straightforward tool for clinicians to better identify the underlying cause of constipation during patient evaluation. The important ways of this are as follows anorectal digital examination, perianal examination, abdominal examination, thyroid examination and spinal assessment (8,13). Abdominal examination may reveal any signs of gas or stool retention, while perianal examination may yield hints to sexual abuse and may reveal fissures or dermatitis (13). Routine digital anorectal examination for the diagnosis of functional constipation is not recommended by the National Institute for Health and Care Excellence (NICE), the European Society of Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) or the North American Society of Paediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN)(14). In addition, fecal occult blood testing is proposed for all infants with constipation, family history of colon cancer, severe abdominal pain, failure to thrive, or colon polyps (8,9). However, FC is a clinical diagnosis based on the Rome IV diagnostic criteria. As the Rome IV criteria are based on symptoms, further diagnostic testing is unnecessary in the absence of red flag signs and symptoms (4,15) (Table 1). Red flag signs and symptoms suggestive of etiologic causes should be excluded (16). The initial management of functional constipation, as outlined in international guidelines, consists of patient and caregiver education, toilet training, and the use of polyethylene glycol (PEG) as a laxative. In addition, the guidelines include normal fiber and fluid intake, regular physical activity, but the use of probiotics, prebiotics, or behavioral therapy is not among the recommendations due to lack of evidence (10,17). While laxatives are considered safe, patient adherence is often low, and apart from polyethylene glycol (PEG), the long-term effects of

chronic use remain poorly understood (18,19). This situation may clarify why a significant proportion (36.4%) of parents of children with functional constipation seek assistance via complementary or alternative therapies (20). Given the significant role of dietary agents in the pathophysiology of FC, nutritional interventions are considered an essential component of its management (21).

Table 1. Rome IV criteria for functional constipation in childhood

Rome IV criteria functional constipation (FC) in infants and toddlers up to four years old (15)
Must include two or more of the following present for at least one month:
1. Two or fewer defaecations per week
2. History of excessive stool retention
3. History of painful or hard bowel movements
4. Presence of a large-diameter stools
5. History of large faecal mass in the rectum
In toilet-trained children, the following additional criteria may be used:
1. At least one episode/week of incontinence after the acquisition of toileting skills
2. History of large-diameter stools that may obstruct the toilet
Rome IV criteria FC in children and adolescents (developmental age ≥ four years) (4)
Must include two or more of the following occurring at least once per week for a minimum of 1 month with insufficient criteria for a diagnosis of irritable bowel syndrome:
1. Two or fewer defaecations in the toilet per week
2. At least one episode of faecal incontinence per week
3. History of retentive posturing or excessive volitional stool retention
4. History of painful or hard bowel movements
5. Presence of a large faecal mass in the rectum
6. History of large-diameter stools that can obstruct the toilet

Complementary Feeding Period in Functional Constipation

Any food and/or formula taken after birth, other than breast milk, is called complementary feeding (22). The World Health Organization (WHO) suggests starting complementary feeding along with breast milk after the 6th month and continuing breastfeeding until the age of 2 (23). Introducing complementary foods during infancy constitutes a pivotal stage in the development of healthy dietary practices and plays a key role in the prevention of gastrointestinal disorders such as constipation (24). To date, different approaches have been proposed for the introduction of these foods, such as baby-led weaning (BLW) and baby-led introduction of solid foods (BLISS) (25). Two methods advocate for the introduction of foods in strip or stick form, enabling the child to self-feed under adult supervision by independently grasping and bringing the food to the mouth (25,26). A review examining the benefits of infant-led weaning reported that infants introduced to solid foods through these approaches exhibited a lower risk of salt and sugar consumption between 25–36 months of age (27). In the study aiming to examine the effect of these methods on FC, mother-infant pairs who underwent an intervention at 5,5 months after birth were randomly assigned to three complementary feed introduction methods: parent-led weaning (PLW), BLISS, and a blended approach. At 12 months, constipation symptoms were evaluated through an online survey in accordance with the Rome IV diagnostic criteria. According to the results, although the prevalence of FC symptoms was higher in the PLW method (60%), no significant relationship was found between the prevalence of symptoms and the methods of initiating complementary feeding (28). A study conducted in Brazil examined the influence of early infant feeding practices on the development of FC by the age of six. The individuals in the study were generally selected from health centers serving low-income families. For the intervention group, doctors, nurses and administrative staff attended training based on the "Ten Steps to Healthy Nutrition for Children from Birth to Two Years of Age" guide (29). After the training, mothers were given a brochure containing detailed information about the guide and provided explanations. When the two groups reached the age of 6 and their constipation symptoms were compared, it was observed that the probability of being constipated was 38% lower in the intervention group (30).

Alternative Nutritional Therapies for Functional Constipation

Fiber

In addition to the recommended medical treatments for functional constipation, attention is also drawn to increasing the amount of absorbable and non-absorbable carbohydrates and fibers taken from the diet (31). Fibers are classified in several ways; these are according to their solubility, viscosity and fermentability. Those that can be fermented are generally considered prebiotics, but not exclusively. Soluble viscous fibers exert their effect by forming a gel-like structure upon hydration, which helps normalize stool consistency, improving both hard and loose stools. Insoluble fibers may have a laxative effect by swelling the stool and increasing peristalsis by stimulating the intestinal mucosa. The recommended daily intake of dietary fiber is estimated by adding five grams to the child's age in years (32,33). According to the Turkish Nutrition Guide (TÜBER), the recommended adequate intake (AI) for 2–3 years of age is 10 g, 14 g for 4–6 years and 21 g for 7–17 years (34). In a study conducted on 100 children aged 4–10 years with chronic FC, it was aimed to compare the effects of dietary fiber and PEG 3350 and electrolyte combination (PEG+E) on FC. One group was given a mixture of acacia fiber (67,7%), psyllium fiber (17,3%) and fructose (AFPFF) (16,8 g/day), and the other group was given PEG+E (0,5 g/kg/day). Based on the analysis conducted from the beginning of the treatment to the end of 8 weeks, significant improvements in constipation symptoms were observed in both groups. No clinically significant side effects were observed in either group during the study period (35).

Probiotics

Probiotics are living microorganisms that, when ingested in adequate amounts, confer health benefits on the host (36). Associations between intestinal motility and various probiotic strains have been found (37). *Bifidobacteria and Lactobacilli*

are strains known to produce acetate and lactate, which may increase intestinal motility (38). In a study conducted on 94 children <5 years of age diagnosed with FC considering Rome III criteria, individuals were divided into two groups to receive *Lactobacillus casei rhamnosus* (Lcr35 8 × 108 CFU) or a comparable placebo (containing 1% magnesium stearate and 99% milk powder). By the conclusion of the study, there was no statistically significant difference in treatment success between the two groups. During the study period (four weeks), a significant decrease in stool frequency was observed in the Lcr35 group relative to the placebo group (39). Another study in FC children aged 4–12 years aimed to explore the role of probiotics in preventing possible PEG-related intestinal dysbiosis. The study compared the constipation symptoms and safety of giving PEG with a probiotic mixture (PM) containing *Bifidobacteria* breve M-16 V®, infantis M-63® and longum BB536® compared to the group given PEG alone. By the second week of the study, overall improvement in constipation was reported in 72% of children receiving PEG and in 59% of those receiving the PEG-probiotic mixture. While no important distinctions were observed between the groups at weeks 4 and 8, substantial improvements in constipation symptoms were evident. No major clinical adverse effects were reported with either PEG or the PEG-probiotic mixture, apart from transient diarrhea, which was resolved by dose reduction (40).

Cow's Milk Free Diet

In cases where laxative treatment does not respond to children with chronic functional constipation, there may be other underlying reasons. One of these reasons is cow's milk allergy (41–43). The relationship between chronic constipation and cow's milk allergy was firs documented by Buisseret in 1978 (44). In the study conducted on a total of 140 children with FC, aged 1–13 years, who received laxative treatment for at least three months, the intervention group did not consume cow's milk or any product made from cow's milk for four weeks. Afterwards, consumption was allowed for two weeks. The control group was allowed to consume cow's milk and its products for six weeks. In the 4th week of the study, there were significant improvements in constipation symptoms in the intervention group. In addition, significant differences were observed between these symptoms when relative to the control group. When the intervention group included cow's milk and its products in their diet for two weeks, there was a significant increase in the number of individuals meeting the Rome III criteria (45).

Cassia fistula Emulsion

The Cassia fistula emulsion (CFE) is an extract sourced from the leguminous species *Cassia fistula*, a member of the same genus (Cassia) as *Cassia officinalis*, widely known as *Senna alexandrina*. Although the precise mechanism of action of senna remains unclear, both senna and *Cassia fistula* are thought to exert stimulant laxative effects via anthraquinone derivatives, which are naturally present in plants as glycosides (46,47). In the study aiming to investigate this effect comparatively, 109 children with FC aged 2–15 years were seperated into two groups, one group receiving CFE and the other group receiving PEG (PEG4000). In every group, individuals were given water-soluble PEG (0,7–0,8 g/kg/day) twice daily for four weeks or CFE (1 cc/kg/day) in three divided doses. Each 1 cc of CFE contained 0,1 g of dried Cassia fistula fruit pulp. At the end of the 4th week, 86,5% of the children in the CFE group and 77,1% of the children in the PEG group were free of FC criteria. While no difference reached statistical significance between the two groups, improvement was observed in both groups. The frequency of bowel movements was significantly higher in the CFE group (10,96±5,7) than in the PEG group (6,9±3,5). Polyethylene glycol compliance was significantly better in the first two weeks, but not in the third and fourth weeks. No clinically significant side effects were observed in these two groups (48).

Descurainia Sophia Seeds (Flixweed seeds)

Flixweed (*Descurainia sophia*) (*D. sophia*) is a famous medicinal plant widely applied in Traditional Iranian Medicine. *D. sophia*is accepted a safe herbal medicine, known for its mild laxative effect, anti-inflammatory and analgesic properties (49,50). *D. sophia* has been reported to be non-toxic up to 2500 mg/kg (51). Approximately 15 amino acids, 10 fatty acids, flavonoids and phenolic compounds were isolated from *D. sophia* seeds (49). The exact mechanism by which Flixweed seeds (Descurainia sophia) work is unknown. It is thought that the seeds may soften stool by producing a mucus that can absorb water from the intestinal lumen. Allyl disulfide, a constituent present in the seeds, is presumed to exert a relaxant effect on smooth muscle and thereby facilitate bowel evacuation (52). A hundred and nine children diagnosed with FC were given *D. sophia* at 2 g/day for 2–4 years of age and 3 g/day for 8 weeks for 4–12 years of age. The other group received PEG. According to the Rome III criteria, two interventions showed similar efficacy in alleviating constipation signs at the end of the week 3 (58,9% in the *D. sophia* group vs. 54,7% in the PEG group). However, by the end of the eighth week, 64,3% of patients in the *D. sophia* group fell outside the criteria compared to 54,7% in the PEG group. No difference reached statistical significance was observed between the effectiveness of the two interventions in the treatment of constipation at the third and eighth weeks of intervention. At the start of the intervention, quantity of patients suffering from gas and abdominal pain in the *D. sophia* group (22=39,3%) was higher than in the PEG group (20=37,7%), while at the end of the eighth week, these values were observed to be lower in the *D. sophia* group (5=8,9%) than in the PEG group (6=11,3%). It was observed that the quantity of patients who did not like the taste of the drug in the *D. sophia* group (17=30%) was significantly higher than in the PEG group (5=9,5%) (53).

Conclusion

This review examines alternative dietary treatments used in the management of functional constipation commonly encountered in childhood. It has been observed that increasing fiber intake has a positive effect on stool volume and intestinal transit time, while probiotic supplements provide significant improvement in symptoms by regulating the intestinal microbiota. It has been reported that elimination of cow's milk also leads to a significant reduction in symptoms in children. The laxative effects of Cassia fistula emulsion and Descurainia sophia seeds, which are evaluated within the scope of traditional herbal approaches, are noteworthy; these herbal products are considered to have a low side effect profile and potential for safe use. Alternative nutritional therapies are important because they have fewer side effects than pharmacological approaches and can be integrated with lifestyle changes. However, more comprehensive evidence is needed to confirm the effectiveness of non-pharmacological interventions in children with FC before strong recommendations for changes to existing guidelines can be made.

Hakem Değerlendirmesi: Dış Bağımsız.

Yazar Katkıları: Fikir - N.K., E.G.D.; Tasarım - N.K., E.G.D.; Literatür Taraması - N.K., E.G.D.; Yazıyı Yazan - N.K., E.G.D.; Eleştirel İnceleme - N.K., E.G.D.

Çıkar Çatışması: Yazarlar çıkar çatışması olmadığını beyan etmişlerdir.

Finansal Destek: Yoktur.

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