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EDITORIAL

Functional constipation in children☆,☆☆

Constipação funcional em crianças

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Childhood constipation is one of the most frequent functional gastrointestinal disorders, with a mean prevalence of 14%.[1] In North and South America, the prevalence in infants to adolescents ranges between 10% and 23%, while for European children, figures between 0.7% and 12% are reported.[2] In Asia, the prevalence in children and adolescents is estimated to be between 0.5% and 29.6%.[2] While constipation occurs in all continents, currently there is a lack of prevalence data in children from Africa and Oceania. Many factors contribute to the large variation in the reported prevalence of constipation in children. The different criteria used for the definition of functional constipation in studies hinders the comparison between prevalence estimates.

The pathophysiology of functional constipation in children remains unclear, but is multifactorial. Recently, the new Rome IV criteria have been released.[3] The most common mechanism for functional constipation is withholding behavior. In young children, it often starts after a painful-frightening bowel movement, while in older children it is due to the very active lifestyle and school system, were children do not have enough time for a proper bowel movement.

The stools remain in the rectum and the rectal mucosa reabsorbs water from the retained stools, making evacuation even more difficult. This vicious circle can lead to fecal impaction, sometimes with fecal overflow incontinence, loss of rectal sensation and ultimately, loss of normal urge to defecate. In a subgroup of children, functional constipation can be due to slow transit.

In 2014, the North-American and European Societies for Pediatric Gastroenterology, Hepatology and Nutrition published new clinical guidelines for the evaluation and treatment of functional constipation in children.[4] The recommendations for the management of functional constipation include ''a normal intake of fibers and fluids, normal physical activity, and an additional pharmacologic treatment for rectal fecal disimpaction followed by a pharmacologic maintenance therapy.''[4] Low intake of water and fiber is one of the dietary risk factors for constipation.[2,4] Therefore, the recommendations are to increase volume of water and fiber up to a normal level, considered appropriate for the age range.[4] Concerning maintenance therapy, the NASPGHAN/ESPGHAN guidelines recommend the use of poly-ethylene glycol (PEG) with or without electrolytes (0.2–0.8 g/kg).[4]

In this issue, Cassettari et al. report on the efficacy of the consumption of 2 tablespoons of green banana biomass (30 g/day) for eight weeks as an adjunct therapy to laxatives in children aged 5–15 years.[5] The conclusion that adding

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dietary fiber to the management of functional constipation is effective and contributes to a reduction of the use of laxatives appears very attractive. In that study, patients were selected in a tertiary level outpatient clinic; outcomes at a primary healthcare level, where the gross of the non-complicated constipated children are attended to, still need to be demonstrated. Children were advised to continue their habitual dietary and fluid intake, but this was not controlled. The study failed to present information on fluid and fiber intake; maybe their intake was far below the recommendations. Although the total number of included patients was 80, only 15 to 17 patients were included in each treatment arm.[5] Five groups of patients were studied: sodium picosulfate, PEG, green banana biomass, picosulfate and green banana biomass, PEG and green banana biomass. In all groups, most symptoms of functional constipation presented a significant improvent.[5] Defecation frequency did not improve in the group in which only green banana biomass was used, while the increase was statistically significant in all other groups, suggesting that laxatives are needed to increase defecation frequency. Abdominal pain improved in all groups, except in the group treated with sodium picosulphate alone. Nevertheless, the acceptability and tolerability were reported to be significantly higher with sodium picosulphate than with PEG.[6] Sodium picosulfate is hydrolyzed by colonic bacteria to form an active metabolite, bis-(p-hydroxy-phenyl)-pyridyl-2-methane, which acts directly on the colonic mucosa to stimulate colonic peristalsis. The non-improvement of abdominal pain may be explained by the fact that picosulphate stimulates peristalsis, and thus may increase cramps and pain. However, fecal incontinence, one of the most inconvenient and social isolating consequences of functional constipation, decreased only in the groups in which green banana biomass was combined with laxatives.

The preparation of the green banana biomass was described in detail and was very well standardized, increasing the scientific value of the design and the findings of the study, but the extrapolation of the findings is questionable. The primary endpoint was set at eight weeks.[5] As a consequence, data on the long term efficacy are missing. Bananas, which originated in the Indo-Malaysia region, are the fourth largest fruit crop in the world. Although green banana is simply an unripe yellow banana, it has different properties. While a yellow banana can be eaten immediately after peeling, the green banana is best eaten cooked, either boiled or fried. The biomass preparation that was used in the study, unpeeled green banana, seems to differ from how the fruit is normally consumed. Nutritionally, the green banana is a good source of fiber, vitamins, and minerals. It contains also a starch that may contribute to a better blood sugar and cholesterol control, as well as weight management.

However, the levels of tannins in green bananas range from 122.6 mg to 241.4 mg. As bananas ripen, the tannin content decreases and becomes part of the pulp. Tannins, commonly referred to as tannic acid, are water-soluble polyphenols that are present in many plant foods. They have been reported to be responsible for decreases in food intake, growth rate, feed efficiency, net metabolizable energy, and protein digestibility in experimental animals.[7] Therefore, foods rich in tannins are considered to be of low nutritional value. However, recent findings indicate that the main effect of tannins was not due to inhibition on food consumption or digestion but rather the decreased efficiency in converting the absorbed nutrients to new body substances. The antimicrobial activities of tannins are well documented,[8] as demonstrated by the inhibition in the growth of many fungi, yeasts, bacteria, and viruses. Tannic acid and propyl gallate, but not gallic acid, inhibit food-borne bacteria, aquatic bacteria, and off-flavor-producing microorganisms. Their antimicrobial properties appear to be associated with the hydrolysis of ester linkage between gallic acid and polyols hydrolyzed after ripening of many edible fruits. Thus, fruit tannins serve as a natural defense mechanism against microbial infections. Tannins have also been reported to exert other physiological effects, such as accelerating blood clotting, reducing blood pressure, decreasing serum lipid level, producing liver necrosis, and modulating immunoresponses.[7,8]

Although seldom observed, a downside of tannins is that they can give some people headaches.[9] Tannins are thus a double-edged sword – while they provide some health benefits, tannins can interfere with digestion and absorption of minerals from food, especially iron.[10] Eating large amounts of tannins can induce constipation and stomach pain, since these plant-based compounds affect the gut mucosa and prevent relaxation of the digestive tract muscles.

Unfortunately, there is no information on the habitual fluid and fiber consumption of the included patients. Therefore, it is not known whether the additional green banana biomass raised the fiber intake to normal levels or whether the fiber intake was increased above the recommended levels. In other words, the question of whether fiber consumption above the recommended intake would be beneficial has not been addressed. A too low fiber intake is a well-known cause of functional constipation. We have shown, in a small study, that daily consumption of yellow banana by infants did not change stool composition, in contrast to general parental belief.[11] On the contrary, a trend toward softer stools was shown as 11% of the sample had hard stools at inclusion *versus* 0% after three weeks of daily banana consumption. Formed stools evolved from 30% at inclusion to 81% after three weeks.[11] The conclusion of our pilot trial was that daily consumption of yellow banana tended normalize stool composition in infants, as well in those with liquid or hard stools.[11]

In theory, fiber may have a negative effect on functional constipation if the pathophysiologic mechanism behind is withholding behavior and in cases of insufficient water intake. In cases of withholding behavior, the colon has more time to absorb the water from the fecal bulk, increasing the volume of the dry material, and thus aggravating functional constipation symptoms, such as pain at defecation.

In conclusion, green banana biomass has been shown to be effective in the management of functional constipation and to decrease the need for laxatives. Since green banana is widely available and affordable in many developing countries, this finding is clinically interesting and relevant. The methodology should be repeated at the primary healthcare level and in larger groups. Moreover, the nutritional status of children in many of these countries is also often suboptimal. Since the treatment of functional constipation requires long-term intervention, nutritional consequences (such as an impaired iron absorption due to tannin and fiber administration) need to be evaluated.

Conflicts of interest

The authors declare no conflicts of interest.

References

1. Mugie SM, Benninga MA, Di Lorenzo C. Epidemiology of constipation in children and adults: a systematic review. Best Pract Res Clin Gastroenterol. 2011;25:3–18.
2. Levy EI, Lemmens R, Vandenplas Y, Devreker T. Functional constipation in children: challenges and solutions. Pediatric Health Med Ther. 2017;8:19–27.
3. Hyams JS, Di Lorenzo C, Saps M, Shulman RJ, Staiano A, van Tilburg M. Functional disorders: children and adolescents. Gastroenterology. 2016;150:1456–68.
4. Tabbers MM, DiLorenzo 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.
5. Cassettari VM, Machado NC, Lourenção PL, Carvalho MA, Ortolan EV. Combinations of laxatives and green banana biomass on the treatment of functional constipation in children and adolescents: a randomized study. J Pediatr (Rio J). 2018, http://dx.doi.org/10.1016/j.jped.2017.10.011 [Epub ahead of print].
6. Vejzovic V, Wennick A, Idvall E, Agardh D, Bramhagen AC. Polyethylene glycol- or sodium picosulphate-based laxatives before colonoscopy in children. J Pediatr Gastroenterol Nutr. 2016;62:414–9.
7. Chung KT, Wong TY, Wei CI, Huang YW, Lin Y. Tannins and human health: a review. Crit Rev Food Sci Nutr. 1998;38:421–64.
8. Smeriglio A, Barreca D, Bellocco E, Trombetta D. Proanthocyanidins and hydrolysable tannins: occurrence, dietary intake and pharmacological effects. Br J Pharmacol. 2017;174:1244–62.
9. Mather M. Migraines and tannins – any relationship? Headache. 1997;37:529.
10. Jaramillo Á, Briones L, Andrews M, Arredondo M, Olivares M, Brito A, et al. Effect of phytic acid, tannic acid and pectin on fasting iron bioavailability both in the presence and absence of calcium. J Trace Elem Med Biol. 2015;30:112–7.
11. De Vreker T, Huysentruyt K, Danau B, Vandenplas Y. The impact of banana on stool composition. J Pediatr Gastroenterol Nutr. 2017;64:NP042.