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REVIEW ARTICLE

Constipation in Pediatrics - A Review of Articles Published in the Last Ten Years

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Constipation,
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Abstract

Objective: To carry out a systematic review of data from the literature on constipation in pediatrics to clarify what knowledge is available on the subject that underlies current medical practice. **Methods:** This is an integrative systematic review study using the BVS and SciELO databases, analyzing works published between 2013 and 2023 in Portuguese and English. **Results:** 20 studies were included, in which we can observe that the literature is divergent about risk factors for the development of constipation, but breastfeeding remains as a protective factor. The etiology and physiopathology of the condition are multifactorial and are based on a vicious cycle triggered by painful evacuation experiences. In order for the patient who usually has a low bowel movement frequency and abdominal pain to be diagnosed, there are constantly evolving criteria that currently comply with the Rome IV standardization. The treatment is based on 4 pillars: demystification, fecal disimpaction, change in diet and life habits and use of laxatives. **Conclusion:** It was concluded from the work that despite the constant evolution of knowledge on the subject, there are still gaps to be filled, mainly in treatment and diagnosis. In addition, it was possible to notice the report about the lack of knowledge of health professionals regarding the most recent updates in the literature.

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INTRODUCTION

The term "Constipation" is derived from the Latin "constipare", which means to gather or squeeze; in parallel, in pediatrics, constipation is defined as a delay or resistance to evacuation, with a history of two or fewer bowel movements per week, and may be associated with fecal incontinence, fecal retention and/or pain during evacuation.[1] It is classified as functional constipation (FC) when, after clinical evaluation and physical examination of the pediatric patient, it cannot be attributed to any intestinal or extraintestinal disorder, according to the ROME IV consensus.[1]

This condition is a common complaint in pediatric consultations, causing approximately 3% of consultations in pediatric outpatient clinics, approximately 1/4 of pediatric gastroenterology consultations and covering more than 90% of cases classified as functional gastrointestinal disorders in pediatrics.[2,3] In Brazil, the prevalence of onset of symptoms in the first year of life is estimated at 67.5%, while worldwide, a prevalence ranging from 17 to 40% is described for the same age group.[4]

Although its diagnosis and treatment are relatively simple, constipation affects the physical and emotional integrity of the child and can have significant implications for their quality of life and can represent a significant burden at the primary and secondary levels of health care.[5,6] In addition, studies indicate that approximately 15% of children with non-retentive functional constipation with fecal incontinence still have the same symptoms at 18 years of age, which demonstrates the chronic nature of functional constipation and the importance of an early, multidisciplinary and specialized approach.[7] Therefore, constipation should be considered an important health problem in the pediatric age group, and knowledge about its definitions, causes and management is highly relevant. Thus, the objective of this article is to identify and analyze national and international scientific production on the topic of "constipation in pediatrics", highlighting knowledge and recommendations that support current medical practice. In addition, we identify the points that still require attention and study regarding this common and important condition.

METHODS

We used the Virtual Health Library (BVS) and the Scientific Electronic Library Online (SciELO) databases. The period evaluated was from January 2013 to August 2023. We searched for papers published in English and Portuguese, using the search strategies "constipation in pediatrics", "Intestinal Constipation" and using the Boolean operators AND and OR.

From this search, we took 32 papers, of which 12 were excluded due to repetition, for not being directly related to the objectives of the study, or for not being available in full for free. Thus, 20 publications remained and were taken into consideration in the current review.

The data found were analyzed and interpreted, including the references of the selected articles in an attempt to obtain other non-indexed publications for comparison.

The topics analyzed were: Risk factors, etiology and pathophysiology, clinical manifestations and diagnosis, treatment and level of knowledge of healthcare professionals.

RESULTS AND DISCUSSION

The 20 articles studied included literature reviews, prospective studies, cross-sectional studies, evidence-based guidelines, research projects, randomized and non-randomized studies, meta-analyses and case series studies. However, it is fair to say that this study has limitations related to the filters applied, databases searched and the use of only freely available articles.

The results were organized into the following categories:

Risk Factors

Although multiple variables are constantly studied in search of a specific risk pattern for constipation in children, the data found in the literature are still divergent in several aspects.

In this sense, in a study conducted with children older than 2 years, functional constipation was significantly associated with the female sex, with low maternal educational level, with living in communities with more than 3,000 inhabitants and with not having older siblings.[8] However, another study - conducted in Santa Cruz do Sul (RS-Brazil) - that sought to evaluate similar parameters, found a higher prevalence (61.3%) of males in relation to females in the diagnosis of constipation.[4]

Therefore, it is clear that regarding gender as a risk factor for constipation, most references describe a slight predominance in females, but other authors found a greater predominance in males; therefore, neither sex was defined as a risk factor due to the discordance present in the literature.

Another possible risk factor analyzed by the references in this article was the use of acetaminophen, a drug widely used in pediatrics to treat complaints such as pain and fever. Regarding this topic, in a prospective study of 402 children in Italy, acetaminophen was not a risk factor for the development of FC at 3 months, but at 6 months a significant trend was found for the use of this drug in children with constipation, and at 12 months of life it was observed that 79.1% of children with constipation had used acetaminophen, in contrast to 58.2% of children without constipation. Thus, the study ended up concluding that functional constipation was significantly associated with the use of acetaminophen, even though the exact role of this drug in the induction of chronic constipation is not well understood (3 possible mechanisms were postulated: high rate of increased intake of the drug as a result of the high frequency of abdominal or somatic pain, the use of a formulation with added opioid and the possible antiserotonergic effects of acetaminophen).[8]

The same Italian study evaluated the family history of atopy as an independent risk factor for FC; However, the multivariate conditional logistic regression analysis did not prove an increase in risk independent of other factors at 3 and 6 months of age. Despite this, the authors of this same study found a higher prevalence of family history of atopy in constipated children when compared to those without constipation. Therefore, although it is not defined as an independent risk factor, family history of atopy is an important fact to be considered when investigating constipation.

Another risk factor studied was low water intake, on which a literature review published in 2017 in the Journal of Pediatrics concluded that lower water consumption is associated with a higher risk of intestinal constipation.[9]

Finally, it is worth noting that some protective factors for pediatric constipation are well defined in the literature. At this point, it is worth noting that several studies have shown that the likelihood of developing constipation is lower in children who are exclusively or predominantly breastfed when compared to children who are not breastfed or who are formula fed.[8,4]

Etiology and pathophysiology

Constipation undoubtedly has a multifactorial etiology and, for now, its pathophysiology is not completely understood. Thus, as observed in other functional gastrointestinal disorders, constipation in childhood results from the interaction of biological, dietary and psychosocial factors that interfere with intestinal motility.[9]

Furthermore, the causes of constipation must be differentiated between those responsible for the development of FC and those that constitute an organic cause of constipation. For example, organic causes of constipation include metabolic disorders (hypothyroidism, cystic fibrosis, hypercalcemia and hypokalemia), neuropathic disorders (Hirschsprung's disease, myelomeningocele, spina bifida, cerebral palsy) and immunological disorders (allergy to cow's milk protein, celiac disease), as well as the use of medications such as iron salts, antacids, anti-inflammatories and opioids.[5] On the other hand, the most common cause of functional constipation appears to be the development of stool retention behavior after a painful defecation experience.[8]

What happens in cases of FC is that, due to the retention behavior triggered by the painful experience, the feces remain longer in the colon, where the mucosa absorbs the water from the fecal mass. From this, a vicious cycle begins, as the dry feces become harder and more difficult to eliminate. This vicious cycle between traumatic experiences of painful evacuation and retention behavior forms the basis for the persistence of the condition.

Furthermore, in functional constipation there will be rectal dilation, which will probably be more severe in children who have had symptoms for a longer period. This dilation is caused by the presence of impaction of fecal matter in the rectum, which also generates the production of a serous secretion by the rectal mucosa that drags small quantities of solid material from the edges of the fecal matter, generating the symptoms of fecal leakage (usually misunderstood by the child's family).[10]

Furthermore, it has been suggested in the literature that prolonged fecal stasis in the colon of constipated patients may result in changes in the intestinal microbiota, influencing several intestinal functions, including motility.[3] These possible changes gain even more importance as recent evidence suggests that severe chronic constipation in children may be due to slowed intestinal transit.[11] However, in this sense, it is necessary to emphasize that in a systematic review of the literature published in the Revista Paulista de Pediatria in 2020, the results obtained on the fecal microbiota of children and adolescents with constipation were discrepant. According to this review, the different methodologies used to analyze the fecal microbiota of the individuals studied and the different species of bacteria evaluated made it impossible to determine a specific pattern of fecal microbiota abnormalities in patients with intestinal constipation.[3]

Clinical manifestations and diagnosis:

The main symptoms present in constipated children are: painful and/or infrequent defecation, fecal incontinence and abdominal pain. In up to 40% of children, signs of constipation begin in the first year of life and approximately 16%-40% of children with functional constipation develop symptoms during the first 6 months.[2,8]

The diagnosis of constipation is initially based on the anamnesis and physical examination. Although most children do not have an identified organic pathology and are diagnosed with functional constipation, it is essential to look for signs of other disorders that may present with difficulties in evacuation.[10]

Among the warning signs that should attract the attention of the pediatrician, WE highlight:[12]

- Constipation in the neonatal period and elimination of meconium after 48 hours of life: may suggest Hirschsprung's Disease or Cystic Fibrosis;
- Urinary Symptoms;
- Systemic Symptoms (weight loss/lethargy);
- Bleeding in the stool: in these cases, it is important to investigate the presence of anal fissure, allergies (a dietary history is essential and should include the mother if the child is still being breastfed) and inflammatory bowel diseases (IBD);
- Perianal fistula: which may also suggest IBD;
- Sacral depression: myelomeningocele is a congenital malformation of the spine that can evolve with both fecal retention and incontinence and present with sacral depression;
- Absence of perianal sensitivity;

- Establishment of constipation before the 1st month of life;
- Atrophied or asymmetrical glutes: may suggest Celiac Disease;
- Fever: is not part of the usual symptoms of constipation, so other causes should be investigated;
- Growth deficit: demonstrates the severity of the condition and may mean impaired development due to the intestinal condition.[12]

Furthermore, due to the vicious cycle that perpetuates the pathophysiology of the condition, it is of great value to determine if any of the following retention behaviors are present:[12]

- Remaining tense;
- Contracting the buttocks;
- Walking on tiptoe;
- Crossing the legs;
- Leaning on (putting pressure on) furniture;
- Staying in the all-fours position or rolling on a ball;
- Sitting with tense legs;

In addition to these, vomiting, diarrhea and severe abdominal distension should always lead to more detailed investigation before diagnosing FC. Regarding additional investigation, laboratory tests should only be performed in doubtful cases to rule out diseases such as hypothyroidism, celiac disease or Hirschsprung's disease.[4] Furthermore, it is important to highlight that although evidence-based guidelines clearly suggest that abdominal radiography is not necessary for the evaluation of constipation (except in very limited circumstances), a study published in 2017 in The Journal of Pediatrics indicated that 97.2% of those interviewed for the article found abdominal radiography useful for diagnosis after care related to constipation. Therefore, in this study, the results support the argument previously made by Yang and Punnati, that there is low knowledge and low adherence to the aforementioned guidelines.[13]

In addition, in the approach, it is necessary to pay attention to the presence of abdominal pain, distension, change in behavior and anorexia in these children, as these signs may indicate the need for decompaction, without which maintenance treatment will lose effectiveness and efficacy.

Still in the evaluation of pediatric patients with complaints related to constipation, an important step is the characterization of the patient's stool type, which is traditionally done using the Bristol Stool Consistency Scale (BSCS).

The Bristol Stool Consistency Scale (BSCS) was developed and validated in Bristol, England, over two decades ago. This scale consists of photographs representing seven types of stool associated with precise descriptions according to their shape and consistency, using recognizable illustrations. To better adapt the scale to the pediatric age group, the modified BSCS for children (mBSCS-C) was created more recently, which proposed reducing the number of stool types from seven to five and adapting the language used in the descriptions to allow children to fully understand the representations of each stool type. However, to enable use in clinical practice outside the country where the scale was created, it is necessary to translate and culturally adapt the scale. Therefore, a group from the UNESP School of Medicine of Botucatu developed a translation, adaptation and application of the scale between 2015 and 2017. In this study, results were obtained that allowed the authors to infer that the mBSCS-C in Brazilian Portuguese was demonstrably reproducible, since almost total agreement was obtained between the translated descriptions and illustrations of the types of stool, between the children and the group of specialists in the areas of gastroenterology and pediatrics. All types of stool showed percentages of correct assignments considered adequate, and this was true for children between six and eight years old and those over eight years of age.[14]

Having exposed the most important manifestations of intestinal constipation, it is now possible to highlight the diagnostic criteria and their evolution. Therefore, it is worth noting that the diagnosis of functional constipation is clinical and that for many years there was no standardization of its criteria, until the elaboration of the Rome II criteria for functional constipation in children, the criteria were standardized for the first time. However, these criteria were considered too restrictive and were modified in 2004. The new standardization was ratified by the Rome III criteria (2006).[15]

The criteria proposed in 2006 were used as a diagnostic tool until another update in 2016, in which the Rome IV standardization was established. The Rome IV criteria are currently used as the most up-to-date tool for the diagnosis of functional constipation and are described below.

→ Rome IV criteria for the diagnosis of FC:[12]

In children >4 years and adolescents, there must be two or more of the following characteristics (at least once a week) during a minimum period of 1 month, as long as they do not meet the diagnostic criteria for irritable bowel syndrome.[12]

- Two or fewer bowel movements in the toilet per week when development is compatible with the age of 4 years;
- At least one episode of fecal incontinence per week;
- History of painful or difficult bowel movements;
- Presence of a large fecal mass in the rectum;
- History of elimination of large-caliber feces that may clog the toilet.[12]

In infants and children <4 years of age, there must be two of the following manifestations for more than 1 month.

- Two or fewer bowel movements per week;
- History of excessive stool retention;
- History of difficult or painful bowel movements;
- History of large-caliber stools;
- Presence of a large fecal mass in the rectum.[12]

In children with toilet training, the following should be considered:

- At least 1 episode of fecal incontinence per week after acquiring sphincter control;
- History of elimination of large-caliber feces that can clog the toilet.[12]

For diagnosis, it is necessary that after appropriate medical evaluation, the clinical manifestations are not fully explained by another medical condition.[12]

Finally, it is important to emphasize that early diagnosis and intervention in children (<3 months of symptoms or <2 months of treatment before referral) contributes to the resolution of constipation.[16] However, diagnosing functional constipation using the Rome criteria at its onset can be difficult, since 2 items are required for diagnosis and -except for painful bowel movements- the other signs/symptoms (impression of excessive fecal retention, evacuation frequency less than or equal to twice a week, large fecal mass in the rectum and fecal incontinence) may be rare or difficult to assess at the onset of the condition.[16] In this sense, some studies have indicated that one item, instead of two, should be sufficient for an early diagnosis.[16]

Treatment

When talking about treatment of constipation in children, although many alternatives are postulated by several authors, there are very few proven studies to support any recommendations for the treatment of constipation in pediatric patients.[17] However, international entities have made continuous efforts to ensure that recommendations on the management of these patients are increasingly effective. For example, The Constipation Guideline Committee of the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) has developed guidelines for functional constipation and its management, with the initial guide being published in 1999.[10]

Current treatment is based on four pillars: demystification, fecal disimpaction, changes in diet and lifestyle habits, and use of laxatives. Disimpaction can be done orally or rectally, both of which are effective, although the use of oral medications is less invasive and traumatic. Long-term treatment should be done with the use of laxatives, considering lactulose and polyethylene glycol (PEG).[4] Therefore, the latest recommendations from NASPGHAN and ESPGHAN (European Society for Pediatric Gastroenterology, Hepatology and Nutrition) advocate PEG as the drug of choice for the treatment of functional constipation.[7] PEG has been shown to be effective in children under 1 year of age.[12] And it is currently recommended for patients from 6 months of age.

Regarding the first pillar of treatment mentioned, it is necessary to say that educating parents and family members about the understanding of etiology, symptoms, and management principles is of critical importance for achieving successful treatment. Thus, the management of FC should begin with an explanation of the physiological bases of constipation and fecal incontinence to the child and their family.[6]

As for changing habits and lifestyle, toilet training, when indicated, is of utmost importance in breaking the vicious cycle responsible for the child's condition. Toilet training should be guided by the child and aim to recondition bowel habits. Routine is important, so the child should be instructed to remain seated on the toilet for five to ten minutes after main meals, in a position suitable for abdominal press and with support for the feet.[12,5]

Probably the topic of greatest divergence in the literature when it comes to the management of FC is whether or not to indicate the use of dietary fiber for these patients. Dietary fibers are divided into insoluble and soluble. Insoluble fibers increase fecal volume because they resist the action of digestive enzymes and colonic microflora and absorb water from the intestinal lumen. Soluble fibers, fermented by the intestinal flora, release absorbed water and produce fatty acids that cause the co-absorption of electrolytes and fecal water.[1] At this point, when we talk about the importance of water for bowel habits, it is necessary to bring to light that in relation to the role of water in the treatment of intestinal constipation, the few existing articles have not shown any advantage of increased fluid consumption in the treatment.[9] On the other hand, studies with samples from the general population show a favorable effect of increased fluid consumption in the sense of providing an improvement in bowel habits.

Also on the subject of dietary fiber supplementation, a double-blind, placebo-controlled study that evaluated a diet with a fiber mixture in children aged 4 to 12 years for the treatment of constipation concluded that the use of a mixture of 6 different types of dietary fiber did not prevent the need for stool softeners or enemas during the intervention with dietary fiber, nor did it reduce colonic transit time in constipated patients. However, the increase in bowel movement frequency and improvement in stool consistency in children who completed the study were important findings regarding the prevention of recurrent constipation symptoms. It is worth noting that this same study warned about the impossibility of extrapolating its results to patients with severe constipation due to the characteristics of the study population.[18]

In addition, a systematic review published in 2018 in the Journal of Pediatrics of the Brazilian Association of Pediatrics concluded that prescribing fiber supplements in the diet of constipated children as part of the treatment of this disease does not present scientific evidence to support this practice.[1] However, many studies still consider dietary fiber to be very important for the treatment of constipation and claim that, although there is insufficient evidence to indicate its supplementation, there is also no evidence for its contraindication. In this sense, a randomized study with 80 children and adolescents was published in 2019 in the Journal of Pediatrics; this study evaluated the combination of laxatives and green banana biomass for the treatment of constipation. This study was justified because it is known that green bananas contain dietary fiber and a high concentration of amylase-resistant starch, which is neither digested nor absorbed in the intestine, stimulates the production of short-chain fatty acids in the colon and is useful in the treatment of constipation. Furthermore, given that Brazil is one of the world's largest producers of this source of fiber, bananas are an affordable product and are part of the Brazilian diet.[19]

In the aforementioned study, the primary results demonstrated that consumption of green banana biomass alone for eight weeks (30 g/day) reduced the proportion of children with Bristol Stool Consistency Scale scores of 1 or 2 and straining and pain during defecation, but there was no increase in the percentage of children with >3 bowel movements/week. Finally, the conclusion of the study was that adding green banana biomass to the routine treatment of constipation with laxatives in children and adolescents can significantly improve symptoms and, with this combination after eight weeks, it is possible to reduce the dose of laxatives.[19] However, it is necessary to say that, despite the good results obtained, more research in this regard is necessary so that the indication has better evidence.

Another important point to be considered in the treatment of functional constipation in children is the use of prebiotics and probiotics, for which the present literature review found a study that evaluated the efficacy of the prebiotic galactooligosaccharide in the treatment of 20 children and adolescents with constipation. In this study, we found that prebiotics, when ingested by constipated children, were effective in increasing the frequency of bowel movements, relieving pain or discomfort during bowel movements, and softening the consistency of stool.[17] Furthermore, information was found that among the clinical trials in which probiotics were used without association with laxatives, only one study found greater therapeutic success of the probiotic compared to the placebo.3 In these intervention studies that used probiotics, the composition of the intestinal microbiota was not evaluated before and after the administration of probiotics. Thus, the clinical effects observed on motility and characteristics of bowel habits, attributed to the use of probiotics, could not be associated with specific changes in the composition of the intestinal microbiota.[3] Therefore, the data obtained do not support the recommendation of using probiotics in the treatment of functional intestinal constipation.

As for drug therapy, its objectives are to soften the stool so that the child loses the fear of painful bowel movements. When prescribing the medication, parents should be advised that the bowel will not become dependent on the drug. In addition, parents should be informed that the stool will be made artificially soft (almost like diarrhea) before returning to its normal size, shape, and consistency. Treatment of constipation is not effective if the bowel impaction is not treated. The disimpaction dose for children is 1-1.5 g/kg/day of PEG for 3-6 days and the maintenance dose is 0.75 g/kg/day.[12]

In addition, schools should be instructed on the treatment, as children should be allowed free access to the toilet if they feel the need to defecate. Children will generally require a 3-month treatment if they had normal bowel habits previously, symptoms of short duration (less than 3 months), and were toilet trained. Children with a chronic history will generally require at least 6 months of treatment.[12] On this point, a systematic review found that only 50% of children with functional constipation were treated with complete success and had their use of laxatives discontinued after 12 months, both with general pediatricians and pediatric gastroenterologists.[6] A study conducted in Saudi Arabia on pediatricians' knowledge of constipation in pediatrics showed that 45% of respondents prescribed medication for less than 1 month, while 15% of them prescribed it for more than 6 months.[6]

Finally, regarding appendicostomy as a treatment for refractory constipation, an analysis of 28 patients was published in 2020 and concluded that appendicostomy, although it presents a high number of complications, appears to control fecal leakage resulting from intestinal constipation more frequently and earlier than clinical management alone. However, the small number of participants and the conclusions based on risk estimates compel us to suggest that studies with larger samples and longer follow-up should be conducted to allow a more definitive assessment of this outcome.[20]

Level of knowledge of healthcare professionals

A survey conducted during the 36th Brazilian Congress of Pediatrics (2013) applied 297 questionnaires with clinical cases of constipation with impaction and found that the diagnosis was identified by 93.6% of respondents and complementary exams were indicated by 40.4%. Only 64% of respondents indicated a pharmacological approach, while 84.8% indicated patient guidance regarding eating habits. However, only 17.2% indicated disimpaction and PEG was prescribed in 14.5% of the questionnaires. Furthermore, the study found a great disparity between the approaches made by physicians with more time in practice and physicians who graduated more recently, with physicians who graduated more recently requesting fewer imaging tests and prescribing PEG more frequently, which

reinforces the need for constant updating by healthcare professionals.[5] In addition, a study published in 2015 that applied 264 questionnaires on constipation in Minas Gerais found that knowledge about diagnostic tests for constipation varied greatly, especially when comparing general pediatricians with pediatric gastroenterologists.[7]

Such observations made in Brazil corroborate a 2014 American study that compared the clinical practice of pediatricians with the most current recommendations for the time in the management of constipation in pediatrics. The authors concluded that despite the existence of guidelines for the management of functional constipation, knowledge about these guidelines remains low, even among residents and specialists for whom the most current recommendations of the time were available throughout their training time.[10]

CONCLUSION

Based on the literature reviewed, we conclude that the scientific production on the subject of "constipation in pediatrics" is varied and often divergent. Several studies have been carried out in the last ten years in an attempt to make the identification and treatment of constipation in children more effective. Even so, there are still gaps in knowledge on the subject, such as the practical adequacy of diagnostic criteria in the search for early identification and treatment of FC and the correct indication of supplemental fibers in patients with this condition. In addition, it is necessary to emphasize that despite the constant production of scientific knowledge on the subject, the level of knowledge and application of this knowledge by professionals is still low according to the literature.

REFERENCES

1. Mello PP, Eifer DA, Mello ED. Use of fibers in childhood constipation treatment: systematic review with meta-analysis. J Pediatr (Rio J) [Internet]. 2018 Sep; [cited 2023 Aug 28]; 94(5):460-70. Available from: https://pubmed.ncbi.nlm.nih.gov/29474804/
2. 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 [Internet]. 2014 Feb; [cited 2023 Aug 28]; 58(2):258-74. Available from: https://journals.lww.com/jpgn/fulltext/2014/02000/evaluation_and_treatment_of_functional.24.aspx.
3. Gomes DOVS, Morais MB. Microbiota intestinal e emprego dos probióticos na constipação intestinal em crianças e adolescentes: Revisão Sistemática. Rev Paul Pediatr [Internet]. 2019 Nov; [cited 2023 Aug 28]; 38:e2018123. Available from: https://www.scielo.br/j/rpp/a/LbDr9XZ3LjZTQkQSQrhHbHP/?format=pdf&lang%20=en.
4. Bastos MD, Pereira BF, Chaves J, Tabile P, Pereira LM. Características da constipação funcional em crianças de zero a doze anos atendidas em um ambulatório de gastroenterologia pediátrica. Rev Epidemiol Control Infect [Internet]. 2018 Oct; [cited 2023 Aug 28]; 8(4):415-21. Available from: https://online.unisc.br/seer/index.php/epidemiologia/article/view/11253.
5. Vieira MC, Krueger Negrelle IC, Ulaf Webber K, Gosdal M, Krüger Truppel S, Ziemer Kusma S. Conhecimento do pediatra sobre o manejo da constipação intestinal funcional. Rev Paul Pediatr [Internet]. 2016; [cited 2023 Aug 27]; 34(4):425-31. Available from: https://www.redalyc.org/pdf/4060/Resumenes/Resumo_406048356008_5.pdf.
6. Hasosah M, Abdulwahab Telmesani, Al-Binali AM, Sarkhi A, Alghamdi S, Khalid Alquair. Knowledge and Practice Styles of Pediatricians in Saudi Arabia Regarding Childhood Constipation. J Pediatr Gastroenterol Nutr [Internet]. 2013 Jul 1; [cited 2023 Aug 28]; 57(1):85-92. Available from: https://journals.lww.com/jpgn/fulltext/2013/07000/knowledge_and_practice_sty.
7. Torres MRF, Melo MCB, Purcino FAC, Maia JC, Aliani NA, Rocha HC. Knowledge and Practices of Pediatricians Regarding Functional Constipation in the State of Minas Gerais, Brazil. J Pediatr Gastroenterol Nutr [Internet]. 2015 Jul 1; [cited 2023 Aug 27]; 61(1):74-9. Available from: https://journals.lww.com/jpgn/fulltext/2015/07000/knowledge_and_practices_of_pediatricians_regarding.16.aspx.
8. Turco R, Miele E, Russo M, Mastroianni R, Lavorgna A, Paludetto R. Early-Life Factors Associated With Pediatric Functional Constipation. J Pediatr Gastroenterol Nutr [Internet]. 2014 Mar 1; [cited 2023 Aug 28]; 58(3):307-12. Available from: https://journals.lww.com/jpgn/fulltext/2014/03000/early_life_factors_associated _with_pediatric.9.aspx.
9. Boilesen SN, Tahan S, Dias FC, Melli LCFL, Morais MB. Water and fluid intake in the prevention and treatment of functional constipation in children and adolescents: is there evidence? J Pediatr (BR) [Internet]. 2017 Jul; [cited 2023 Aug 28]; 93(4):320-7. Available from: https://www.sciencedirect.com/science/article/pii/S0021755717303315?via%3.
10. Yang CH, Punati J. Practice Patterns of Pediatricians and Trainees for the Management of Functional Constipation Compared With 2006 NASPGHAN Guidelines. J Pediatr Gastroenterol Nutr [Internet]. 2015 Mar; [cited 2023 Aug 27]; 60(3):308-11. Available from: https://journals.lww.com/jpgn/fulltext/2015/03000/practice_patterns_of_pediatri cians_and_trainees.10.aspx.
11. Carmo RLML, Oliveira RPM, Ribeiro AEA, Lima MCL, Amorim BJ, Ribeiro AF, et al. Colonic transit in children and adolescents with chronic constipation. J Pediatr (Rio J) [Internet]. 2015 Jul; [cited 2023 Aug 27]; 91(4):386-91. Available from: https://www.scielo.br/j/jped/a/8hYcfvSPPFb5yQBHXdZ3sWS/?lang=en.
12. Singh H, Connor F. Paediatric constipation: An approach and evidence-based treatment regimen. Aust J Gen Pract [Internet]. 2018 May 1; [cited 2023 Aug 27]; 47(5):273-7. Available from: https://www1.racgp.org.au/ajgp/2018/may/paediatric-constipation/.
13. Beinvogl B, Sabharwal S, McSweeney M, Nurko S. Are We Using Abdominal Radiographs Appropriately in the Management of Pediatric Constipation? J Pediatr (EUA) [Internet]. 2017 Dec; [cited 2023 Aug 28]; 191:179-83. Available from: https://www.jpeds.com/article/S0022-3476(17)31156-3/fulltext.
14. Jozala DR, Oliveira ISF, Ortolan EVP, Oliveira Junior WE, Comes GT, Cassettari VMG. Brazilian Portuguese translation, cross-cultural adaptation and reproducibility assessment of the modified Bristol Stool Form Scale for children. J Pediatr (Rio J) [Internet]. 2019 May; [cited 2023 Aug 28]; 95(3):321-7. Available from: https://www.scielo.br/j/jped/a/dZFRx5XnvsyyQ3yBKzGkZPp/?format=pdf&lang =pt.
15. Gulati R, Komuravelly A, Leb S, Mhanna MJ, Ghori A, Leon J, et al. Usefulness of Assessment of Stool Form by the Modified Bristol Stool Form Scale in Primary Care Pediatrics. Pediatr Gastroenterol Hepatol Nutr [Internet]. 2018; [cited 2023 Aug 28]; 21(2):93. Available from: https://www.pghn.org/DOIx.php?id=10.5223/pghn.2018.21.2.93.
16. Maffei HVL, Morais MB. Proposals to approximate the pediatric rome constipation criteria to everyday practice. Arq Gastroenterol [Internet]. 2018 Aug 21; [cited 2023 Aug 27]; 55:56-60. Available from: https://www.scielo.br/j/ag/a/8zkwX3PSZZxjqH3JpRQrBXk/.

17. Beleli CA, Antonio MA, dos Santos R, Pastore GM, Lomazi EA. Effect of 4'galactooligosaccharide on constipation symptoms. J Pediatr (Rio J) [Internet]. 2015 Nov 1; [cited 2023 Aug 28]; 91(6):567-73. Available from: https://www.jped.com.br/pt-effect-4galactooligosaccharide-on-constipation-sy mptoms-articulo-S2255553615001068.

18. Weber TK, Toporovski MS, Tahan S, Neufeld CB, Morais MB. Dietary Fiber Mixture in Pediatric Patients With Controlled Chronic Constipation. J Pediatr Gastroenterol Nutr [Internet]. 2014 Mar; [cited 2023 Aug 28]; 58(3):297-302. Available from: https://journals.lww.com/jpgn/fulltext/2014/03000/dietary_fiber_mixture_in_ped iatric_patients_with.7.aspx.

19. Lourenção PLTA, Carvalho MA, Ortolan EVP. Combinations of laxatives and green banana biomass on the treatment of functional constipation in children and adolescents: a randomized study. J Pediatr (Rio J) [Internet]. 2019 Jan; [cited 2023 Aug 27]; 95(1):27-33. Available from: https://www.scielo.br/j/jped/av6ZsWYz7MKCmQT5b4SbLr3s/?format=pdf&lan.

20. Vanesca PA, Maria AB, Joaquim MBS, Elizete AL. Refractory functional constipation: clinical management or appendicostomy?. J Pediatr (Rio J) [internet]. 2020; [cited 2023 Aug 27]; 96:210-6. Available from: https://www.scielo.br/j/jped/a/67d7b7bwW4RGpH6mgS9XQtD/?format=pdf&lang=pt.