Concise review: Herbal remedies and herbal plants for constipation in children

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Abstract

Background: Constipation refers to difficult or delayed bowel emptying lasting 2 weeks or more and causing anxiety and distress in patients, and it is one of the most common problems in children. To treat constipation, therapeutic measures such as nutritional methods, feedback training, osmotic laxatives and stimulants, as well as stool volume enhancers, are used; however, each has its own problems and side effects. Medicinal plants have been shown to be effective in the treatment of many diseases, including constipation. Therefore, this review was conducted to report the medicinal plants effective for constipation. Methods: In the current review, eligible articles indexed from databases such as ISI (Web of Science), PubMed, Scopus, Islamic World Science Citation Center, Scientific Information Database, and Magiran were retrieved using the keywords ‘constipation’, ‘children constipation’, ‘baby’s and newborn constipation’, ‘medicinal plants’, and ‘traditional medicine’. Results: Available evidence showed that the medicinal plants Olea europaea, Phaseolus vulgaris, Prunus armeniaca, Brassica oleracea var. italica, Malus domestica, Linum usitatissimum, Aloe vera, Vitis vinifera, Foeniculum vulgare, Ficus carica, Ricinus communis, Sesamum indicum, and Descurainia sophia are some of the most important medicinal plants for the treatment of constipation in traditional medicine. Conclusion: Herbal plants are important for isolation/preparation of new drugs in the treatment of constipation in children. In future studies, it may be beneficial to further understand and classify herbal plants/remedies, based on their mechanisms, as laxatives in the treatment of constipation.

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1. Introduction

Constipation is a common gastrointestinal problem in the community, both in children and adults; in children, it accounts for about 5% of the pediatric visits [1]. Therefore, there are stupendous costs associated with it. Constipation refers to difficult or delayed bowel movement which can last a couple weeks more, and often causes anxiety and distress in the patient [2]. The prevalence of constipation in children has been reported to be 34.7% [3–6]. The most common type of constipation is functional constipation, also known as idiopathic constipation.

Functional constipation is the result of conscious or semi-conscious bowel emptying that leads to rectal dilatation and exacerbation of the disease as a vicious cycle, with mainly mental and psychological underlying causes [7]. Constipation, in most cases, is short-term and has few consequences, but sometimes lasts more than six months and is not treated by routine treatments. Other causes of chronic constipation in children include insufficient diet, the use of some medications, metabolic and endocrine causes, uremia, hypothyroidism, central nervous system tissue disorders, diabetes, and connective tissue diseases [8–12]. To treat constipation, therapeutic measures such as nutritional methods, feedback training, osmotic laxatives and stimulants, as well as stool volumizers, are used. However, each has its own problems and side effects [13].

Traditional medicine and phytomedicine have always been an important solution for the treatment and prevention of various diseases [14–18]. Medicinal plants and their therapeutic uses are very common in Iran and other parts of the world [19,20]. Nowadays, due to the importance of safety and desire for lowered costs, there is greater attention placed on herbal medicines as therapies [21–23]. Herbal medicines have been demonstrated to be consistently reliable in the treatment and prevention of various diseases [24–29]. They have also recently become a focus of researchers in the development and preparation of new drugs [30–35]. Notably, their active ingredients can have antioxidant activities and therapeutic effects [36–40]. Medicinal plants have been used in the treatment of many diseases, including and especially constipation. Therefore, this aim of this review was to investigate and report the medicinal plants affecting constipation.

2. Methods

In the current review, the articles meeting the inclusion criteria and indexed in certain databases, such as ISI (Web of Science), PubMed, Scopus, Islamic World Science Citation Center, Scientific Information Database, and Magiran, were retrieved using the search terms ‘constipation’, ‘children constipation’, ‘baby’s and newborn constipation’, ‘medicinal plants’, and ‘traditional medicine’.

3. Results

Based on available evidence, medicinal plants Olea europaea, Phaseolus vulgaris, Prunus armeniaca, Brassica oleracea var. italic, Malus domestica, Linum usitatissimum, Aloe vera, Vitis vinifera, Foeniculum vulgare, Ficus carica, Ricinus communis, Sesamum indicum, and Descurainia sophia are some of the most important medicinal plants used for the treatment of constipation in traditional medicine. Further information on traditional treatments of constipation in children is presented in Table 1 and Figure 1.

4. Discussion

The present review was conducted to report the medicinal plants effective on constipation. Constipation is one of the primary factors for various diseases, including intestinal colic, and is known as the mother of diseases. As with other diseases, for completion of treatment, constipation requires removing the primary causal factors. The first step, therefore, might be to change patient...
| Botanical name                  | Family name | Effect                                                                                                                                 |
|--------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Olea europaea                  | Oleaceae    | In Japan, Olea europaea is used to treat constipation [41]. Its leaf and fruit are laxative.                                           |
| Phaseolus vulgaris             | Fabaceae    | Phaseolus vulgaris, with high fiber, is used for constipation [42–45].                                                                  |
| Prunus armeniaca              | Rosaceae    | Prunus armeniaca Apricot is a fiber source that can treat constipation [46]                                                              |
| Brassica oleracea var. italica | Brassicaceae| Brassica oleracea var. italica has been reported to be effective in treating gastrointestinal diseases such as constipation, and it can also improve this disease due to high fiber [47]. |
| Malus domestica                | Rosaceae    | Malus domestica and its skin contain dietary fiber and a variety of nutrients, and its dietary fiber swells in the intestines and becomes sticky. This fiber of M. domestica provides the main part with feces and helps stool move along easily and without force [48] |
| Linum usitatissimum            | Linaceae    | Linum usitatissimum is a plant with constipation-relieving effect, from which certain drugs are also produced [48,49]                   |
| Aloe vera                      | Asphodelaceae| Aloe vera can also be used as a natural remedy for constipation [50]                                                                     |
| Vitis vinifera                 | Vitaceae    | Vitis vinifera is used for constipation [51]                                                                                             |
| Foeniculum vulgare             | Apiaceae    | Dried Vitis vinifera (raisin) is used to treat constipation. Foeniculum vulgare and its active ingredients have a laxative effect and can improve constipation [52]. |
| Ficus carica                   | Moraceae    | Ficus carica and its fruit are used to treat chronic constipation [53].                                                                  |
| Ricinus communis               | Euphorbiaceae| Ricinus communis is laxative and is used to treat constipation [54] R. communis oil is used to treat constipation as well.            |
| Sesamum indicum                | Pedaliaceae | Sesamum indicum is laxative and is used to treat constipation [55,56].                                                                  |
| Descurainia sophia             | Brassicaceae| Descurainia sophia was reported to be effective on chronic idiopathic constipation [57].                                                |
lifestyle. The second step might be to incorporate the use of home remedies. Simple changes in the patient’s diet can relieve or reduce the constipation [58].

A high-fiber diet rich in fruits, vegetables, beans, and whole grains can help alleviate the constipation. The recommended dose is 14 g of dietary fiber for every 1,000 calories in the child’s diet. For younger children, the recommended intake is 20 g of dietary fiber a day, for female adolescents it is 29 g a day, and for male adolescents and young men the recommended dose is 38 g a day. Medicinal plants whose components act as anti-constipation agents also have high fiber and are thus more beneficial. Moreover, the use of plentiful fluids increases the softness of the child’s stool.

Another important issue is giving adequate time for bowel movements. The parents should encourage their children to sit on the toilet at least for 5-10 minutes after each meal. Giving small rewards to children for bowel movement attempts can be effective. Children should not be punished if they soil their underwear. Other than changes in the child’s diet, alternative approaches, such as massage of the child’s abdomen or use of medicinal plants, can help relieve constipation [59].

It should be noted that constipation, in some cases, has psychological or neurological basis. In these cases, plants might be effective for these problems [60–63]. The plants presented in this article Table 1 can be used for treatment or prevention of constipation. As aforementioned, the
use of laxatives/medications should be based on the main causes of constipation. Investigations in this field may lead to isolation and preparation of new drugs. An important issue in the use of medicinal plants is their possible toxicities [64,65]. Fortunately, most of these plants are not only safe but they also reduce the toxicity of other toxic agents. The plants highlighted in Table 1, in most cases, can relieve constipation as well as other diseases [66,67].

5. Conclusion
This review article presents important medicinal plants for the treatment and prevention of constipation. These plants can be used for preparation of new drugs; their active ingredients may also be used in the treatment of constipation. In future studies, it is better to focus on classification of herbal laxatives, based on their mechanisms for treating constipation.

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References
1. Simpson BB, Ryan DP, Schnitzer JJ, Flores A, Doody DP. 1996 Surgical evaluation and management of refractory constipation in older children. Journal of pediatric surgery 31, 1040–1042.
2. Baker SS, Liptak GS, Colletti RB, Croffie JM, Lorenzo CD, Ector W, Nurko S. 1999 Constipation in infants and children: evaluation and treatment. Journal of pediatric gastroenterology and nutrition 29, 612–626.
3. Farnam A, Rafeey M, Farhang S, Khodjastejafari S. 2009 Functional constipation in children: does maternal personality matter?. Italian journal of pediatrics 35, 25.
4. Khanna V, Poddar U, Yachha SK. 2010 Etiology and clinical spectrum of constipation in Indian children. Indian pediatrics 47, 1025–1030.

5. Issenman RM, Hewson S, Pirhonen D, Taylor W, Tiros A. 1987 Are chronic digestive complaints the result of abnormal dietary patterns? Diet and digestive complaints in children at 22 and 40 months of age. American Journal of Diseases of Children 141, 679–682.

6. Yong D, Beattie RM. 1998 Normal bowel habit and prevalence of constipation in primary-school children. Ambulatory Child Health 4, 277–277.

7. Weinberg G, Boley SJ. 1980 Anorectal continence and management of constipation. Ashcraft KW, Holcomb GW, Murphy JP. Pediatric surgery. 4th ed. Philadelphia: Elsevier Inc. 522.

8. Carroccio A, Iacono G. 2006 Chronic constipation and food hypersensitivity-an intriguing relationship. Alimentary pharmacology & therapeutics 24, 1295–1304.

9. Afzal NA, Tighe MP, Thomson MA. 2011 Constipation in children. Italian journal of pediatrics 37, 28.

10. Pashankar DS, Loening-Baucke V. 2005 Increased prevalence of obesity in children with functional constipation evaluated in an academic medical center. Pediatrics 116, e377–e380.

11. Dietz WH. 1998 Health consequences of obesity in youth: childhood predictors of adult disease. Pediatrics 101, 518–525.

12. van Dijk M, Benninga MA, Grootenhuis MA, Last BF. 2010 Prevalence and associated clinical characteristics of behavior problems in constipated children. Pediatrics pp. peds–2008.

13. Pashankar DS. 2005 Childhood constipation: evaluation and management. Clinics in colon and rectal surgery 18, 120.

14. Asgari S, Setorki M, Rafieian-kopaei M, Shahinfard N, Ansari R, Forouz Z et al.. 2012 Postprandial hypolipidemic and hypoglycemic effects of Allium hirtifolium and Sesamum indicum on hypercholesterolemic rabbits. African Journal of Pharmacy and Pharmacology 6, 1131–1135.

15. Jalaly L, Sharifi G, Faramarzi M, Nematsollahi A, Rafieian-Kopaei M, Amiri M, Moattar F. 2015 Comparison of the effects of Crataegus oxyacantha extract, aerobic exercise and their combination on the serum levels of ICAM-1 and E-Selectin in patients with stable angina pectoris. DARU Journal of Pharmaceutical Sciences 23, 54.

16. Rahimi-Madiseh M, Heidarian E, Kheiri S, Rafieian-Kopaei M. 2017 Effect of hydroalcoholic Allium ampeloprasum extract on oxidative stress, diabetes mellitus and dyslipidemia in alloxan-induced diabetic rats. Biomedicine & Pharmacotherapy 86, 363–367.

17. Shayanianis, E, Bahmani M, Asgary S, Rafieian-Kopaei M. 2016 Inflammaging and cardiovascular disease: Management by medicinal plants. Phytomedicine 23, 1119–1126.

18. Rabiei Z, Gholami M, Rafieian-Kopaei M. 2016 Antidepressant effects of Mentha pulegium in mice. Bangladesh Journal of Pharmacology 11, 711–715.

19. Ebrahimie M, Bahmani M, Shirzad H, Rafieian-Kopaei M, Saki K. 2015 A review study on the effect of Iranian herbal medicines on opioid withdrawal syndrome. Journal of evidence-based complementary & alternative medicine 20, 302–309.

20. Bahmani M, Shirzad H, Rafieian S, Rafieian-Kopaei M. 2015 Silybum marianum: beyond their antagonistic effect on pathogens. International journal of pharmaceutical investigation 7, 137.

21. Rahimi-Madiseh M, Karimian P, Kheiri H, Rafieian-Kopaei M. 2017a The effects of ethanol extract of Berberis vulgaris fruit on histopathological changes and biochemical markers of the liver damage in diabetic rats. Iranian journal of basic medical sciences 20, 552.

22. Rahimi-Madiseh M, Lorigooini Z, Zamani-gharaghoshi H, Rafieian-kopaei M. 2017b Berberis vulgaris: specifications and traditional uses. Iranian journal of basic medical sciences 20, 569.

23. Rabiei Z, Gholami M, Rafieian-Kopaei M. 2016 Antidepressant effects of Mentha pulegium in mice. Bangladesh Journal of Pharmacology 11, 711–715.

24. Rabiei Z, Gholami M, Rafieian-Kopaei M. 2016 Antidepressant effects of Mentha pulegium in mice. Bangladesh Journal of Pharmacology 11, 711–715.

25. Rahimi-Madiseh M, Heidarian E, Kheiri S, Rafieian-Kopaei M. 2017 Effect of hydroalcoholic Allium ampeloprasum extract on oxidative stress, diabetes mellitus and dyslipidemia in alloxan-induced diabetic rats. Biomedicine & Pharmacotherapy 86, 363–367.
29. Rabiei Z, Naderi S, Rafieian-Kopaei M. 2017 Study of antidepressant effects of grape seed oil in male mice using tail suspension and forced swim tests. Bangladesh Journal of Pharmacology 12, 397–402.

30. Sarrafchi A, Bahmani M, Shirzad H, Rafieian-Kopaei M. 2016 Oxidative stress and Parkinson’s disease: New hopes in treatment with herbal antioxidants. Current pharmaceutical design 22, 238–246.

31. Bahmani M, Sarrafchi A, Shirzad H, Asgari S, Rafieian-Kopaei M. 2017 Cardiovascular Toxicity of Cyclooxygenase Inhibitors and Promising Natural Substitutes. Current pharmaceutical design 23, 952–960.

32. Rouhi-Boroujeni H, Heidarian E, Rouhi-Boroujeni H, Deris F, Rafieian-Kopaei M. 2017 Medicinal plants with multiple effects on cardiovascular diseases: A systematic review. Current pharmaceutical design 23, 999–1015.

33. Asgary S, Sahebkar A, Afshani MR, Keshvari M, Haghjooyjavanmard S, Rafieian-Kopaei M. 2014 Clinical evaluation of blood pressure lowering, endothelial function improving, hypolipidemic and anti-inflammatory effects of pomegranate juice in hypertensive subjects. Phytotherapy Research 28, 193–199.

34. Rabiei Z, Rafieian-Kopaei M, Mokhtari S, Shahrani M. 2014 Effect of dietary ethanolic extract of Lavandula officinalis on serum lipids profile in rats. Iranian journal of pharmaceutical research: IJPR 13, 1295.

35. Setorki M, Nazari B, Asgary S, Azadbakht L, Rafieian-Kopaei M. 2011 Anti atherosclerotic effects of verjuice on hypocholesterolemic rabbits. African Journal of Pharmacy and Pharmacology 5, 1038–1045.

36. Shirzad H, Shahrani M, Rafieian-Kopaei M. 2009 Comparison of morphine and tramadol effects on phagocytic activity of mice peritoneal phagocytes in vivo. International immunopharmacology 9, 968–970.

37. Karimi A, Mohammadi-Kamalabadi M, Rafieian-Kopaei M, Amjad L et al. 2016 Determination of antioxidant activity, phenolic contents and antiviral potential of methanol extract of Euphorbia spinidens Bornm (Euphorbiaceae). Tropical Journal of Pharmaceutical Research 15, 759–764.

38. Bahmani M, Zargaran A, Rafieian-Kopaei M. 2014 Identification of medicinal plants of Urmia for treatment of gastrointestinal disorders. Revista Brasileira de Farmacognosia 24, 468–480.

39. Hosseini Z, Lorigooini Z, Rafieian-Kopaei M, Shirmardi HA, Solati K. 2017 A review of botany and pharmacological effect and chemical composition of Echinophora species growing in Iran. Pharmacognosy research 9, 305.

40. Heidarian E, Rafieian-Kopaei M. 2013 Protective effect of artichoke (Cynara scolymus) leaf extract against lead toxicity in rat. Pharmaceutical biology 51, 1104–1109.

41. Bellakhdar J, Claiss R, Fleurentin J, Younos C. 1991 Repertory of standard herbal drugs in the Moroccan pharmacopoea. Journal of ethnopharmacology 35, 123–143.

42. http://www.livingnaturally.com/ns/DisplayMonograph.asp?StoreID=75BC25A99042AC827A9E89ED3918A8&DocID=bottobean.

43. Mkanda AV, Minnaar A, Kock HLD. 2007 Relating consumer preferences to sensory and physicochemical properties of dry beans (Phaseolus vulgaris). Journal of the Science of Food and Agriculture 87, 2868–2879.

44. Obiro WC, Zhang T, Jiang B. 2008 The nutraceutical role of the Phaseolus vulgaris α-amylase inhibitor. British journal of nutrition 100, 1–12.

45. Okada Y, Okada M. 2007 Effects of radical scavenger protein from broad beans on glutathione status in human lung fibroblasts. Environmental health and preventive medicine 12, 272–277.

46. http://www.naturalmedicinalherbs.net/herbs/p/prunus-armeniaca=apricot.php.

47. https://www.ayurtimes.com/apple-fruit-malus-domestica/. .

48. European Medicines Agency Evaluation of Medicines for Human Use. London, 25 October 2006; Doc. Ref: EMEA/HMPC/167395/2006... .

49. https://www.amazon.com/Constipation-Usitatissimum-Fenugreek-Trigonella-foenum-graecum/dp/B00WQ7BMSO?h=1... .

50. https://www.wikichow.com/Use-Aloe-Vera-to-Treat-Constipation. .

51. Badet C. 2011 Antibacterial activity of grape (Vitis vinifera, Vitis rotundifolia) seeds. .
53. Oh HG, Lee HY, Seo MY, Kang YR, Kim JH, Park JW, Kim OJ, Back HI, Kim SY, Oh MR et al. 2011 Effects of Ficus carica paste on constipation induced by a high-protein feed and movement restriction in beagles. *Laboratory animal research* 27, 275–281.

54. Worbs S, Köhler K, Pauly D, Avondet MA, Schaefer M, Dorner MB, Dorner BG. 2011 Ricinus communis intoxications in human and veterinary medicine—a summary of real cases. *Toxins* 3, 1332–1372.

55. Hu Y, Ye W, Yin Z, Zhao S. 2007 Chemical constituents from flos Sesamum indicum L. *Yao xue xue bao= Acta pharmaceutica Sinica, volume* 42, pp. 286–291.

56. Stohs SJ, Badmaev V. 2016 A review of natural stimulant and non-stimulant thermogenic agents. *Phytotherapy Research* 30, 732–740.

57. Choopani R, Ghourchian A, Hajimehdipoor H, Kamalinejad M, Ghourchian F. 2017 Effect of Descurainia sophia (L.) Webb ex Prantl on adult functional constipation: a prospective pilot study. *Journal of evidence-based complementary & alternative medicine* 22, 646–651.

58. Hamedi SH, Jokar A, Abbasian A. 2012 Viewpoints of Iranian traditional medicine (ITM) about etiology of constipation. *J Gastroint Dig Syst S* 8, 12.

59. Jackson WA. 2001 A short guide to humoral medicine. *Trends in pharmacological sciences* 22, 487–489.

60. Solati K, Heidari-Soureshjani S, Luther T, Asadi-Samani M. 2017 Iranian medicinal plants effective on sexual disorders: A systematic review. *International journal of pharmaceutical sciences and research* 8, 2415–20.

61. Hosseini Z, Lorigooini Z, Rafieian-Kopaei M, Shirmardi HA, Solati K. 2017 A review of botany and pharmacological effect and chemical composition of Echinophora species growing in Iran. *Pharmacognosy research* 9, 305.

62. Heidari-Soureshjani S. 2017 Effects and mechanisms of medicinal plants on dopamine reward system to reduce complications of substance abuse: A systematic review. *Middle East Journal of Family Medicine* 7, 202.

63. Solati K, Heidari-Soureshjani S, Pocock L. 2017 Effects and mechanisms of medicinal plants on stress hormone (cortisol): A systematic review. *Middle East Journal of Family Medicine* 7, 117.

64. Baradaran A, Nasri H, Rafieian-Kopaei M. 2013 Erythropoietin and renal protection. *DARU Journal of Pharmaceutical Sciences* 21, 78.

65. Asgharzade S, Rafieian-kopaei M, Mirzaeian A, Reisi S, Salimzadeh L. 2015 Aloe vera toxic effects: expression of inducible nitric oxide synthase (iNOS) in testis of Wistar rat. *Iranian journal of basic medical sciences* 18, 967.

66. Kazemi S, Shrizad H, Rafieian-Kopaei M. 2018 Recent findings in molecular basis of inflammation and anti-inflammatory plants.. *Current pharmaceutical design*.

67. Sedighi M, Noori-Ahmadabadi M, Rafieian-Kopaei M, Ebrahimpoor-Samani J, Shahinfard N. 2014 The effect of Rosa damascena Mill hydro-alcoholic extract on the ileum contraction in rat. *Journal of Mazandaran University of Medical Sciences* 23, 30–39.