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# Herbal plants for Childhood Anemia and Their Mechanisms of Action: A Review Study

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**A B S T R A C T**

**Objective:** Anemia is one of the most common health issues in children, potentially causing adverse effects on their growth and development. This condition often arises from iron deficiency or the lack of other essential nutrients in the body. Timely identification and treatment of anemia in children are critical to preventing more serious complications. The present review aims to identify the most important medicinal plants and edible fruits used in Iranian traditional medicine for alleviating anemia in children.

**Methods:** This study is a comprehensive review of medicinal plants effective against anemia in children, specifically focusing on Iranian traditional medicine. A search was conducted in reputable scientific databases, including Web of Science, Medline, PubMed, Scopus, SID, and Google Scholar, using keywords such as "medicinal plants," "anemia," "children," "herbal medicine," and "traditional medicine." Inclusion criteria comprised original articles, studies, and traditional medicine texts written in Persian or English. Exclusion criteria included studies lacking sufficient scientific data, duplicate articles, irrelevant studies, and those published in languages other than Persian or English.

**Results:** The findings revealed that medicinal plants and edible fruits such as Rumex, Urtica, Taraxacum, banana, pomegranate, sesame, tomato, alfalfa, parsley, Arctium, raisin, wormwood, bell pepper, strawberry, spinach, date, fenugreek, and lime are commonly used to alleviate anemia in children. Leaves and fruits were the most frequently utilized parts of these plants. The family Asteraceae encompassed the largest number of plants in the reviewed sources. Iron and vitamin C were identified as the primary active compounds in most of these plants.

**Conclusion:** Studies suggest that medicinal plants can serve as effective complementary treatments for childhood anemia. These plants improve iron absorption and boost the immune system, thereby aiding in the alleviation of anemia symptoms in children.

**Keywords:** Anemia, Children, Disease, Treatment, Medicinal plants

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## Introduction

Anemia occurs when the number of red blood cells or the hemoglobin level within these cells falls below normal levels [1]. Hemoglobin is a protein found in red blood cells that is responsible for transporting oxygen throughout the body and removing carbon dioxide [2]. A reduction in hemoglobin levels can lead to inadequate oxygen supply to the cells or a buildup of carbon dioxide in the body [2]. In children, anemia can have multiple causes and present in various forms [3]. Some types of anemia and the manner in which their symptoms manifest will be discussed below

Common symptoms of iron deficiency anemia in children include coughing, nasal congestion, vomiting, diarrhea, abdominal pain, and pale skin. Additionally, irritability, mood swings, unusual cravings (pica), swelling in the neck, cellulitis, nosebleeds, blood in the stool, bloody vomiting, and cognitive issues such as learning difficulties, memory problems, and intelligence impairments are also frequent indicators of the disease [4]. Other forms of anemia may present with different symptoms, but in some cases, the disease can be latent and asymptomatic. In certain instances, anemia is identified incidentally through blood tests conducted for other purposes [5].

Diagnosing anemia in children can be challenging because its symptoms may be mild or similar to those of other illnesses. A doctor will begin the diagnosis by reviewing the child's medical history, diet, and growth [6]. A Complete Blood Count (CBC) is the most common test used to diagnose anemia, measuring the number of blood cells and comparing the results to normal ranges to identify anemia [6]. In children and infants, anemia may arise due to causes such as iron, vitamin B12, or folic acid deficiency, genetic diseases like thalassemia, blood loss from frequent bleeding episodes, and chronic conditions such as kidney problems or severe infections. Each of these factors can decrease red blood cell production, leading to anemia [7].

Key risk factors for anemia in children include being born in low-income countries, premature birth, low birth weight, early feeding with cow or goat milk before the age of one, consuming more than 750 mL of cow or goat milk between the ages of 1 to 4 years, exclusive breastfeeding without complementary food, a lack of iron and vitamins in the diet, and prolonged infectious, kidney, or liver diseases [8, 9].

Treating anemia in children with proper nutrition can significantly improve their condition. A deficiency in even one essential nutrient can hinder a child's growth and prevent optimal development [10]. Iron is one of the vital nutrients, and its deficiency can lead to anemia. A child's diet should include adequate amounts of essential nutrients such as fiber, iron, protein, vitamins, and minerals to promote health and proper growth [9, 10]. Anemia treatment in children depends on factors such as the severity of the anemia, its type, and any underlying conditions that may aid in symptom relief and improve treatment [11].

One common treatment for childhood anemia is the use of iron supplements. Various products such as Feroglobin syrup, IronVit drops (Vitane), Liposopher (BSK), and Feramax (Biosyent) are designed to provide iron and other essential nutrients. These supplements typically contain iron, vitamins, and minerals and help improve anemia symptoms [11, 12].

Iran, with its diverse climate and biodiversity, is a rich source of medicinal plants used in traditional medicine and ethnobotany for the treatment of various diseases [13]. Medicinal plants have gained attention as a complementary treatment option in managing childhood anemia. Many of these plants contain compounds that enhance iron absorption and support red blood cell production. Using medicinal plants alongside conventional treatments can help improve anemia in children [14]. The aim of this review study is to identify medicinal plants and edible fruits effective in treating childhood anemia according to Iranian traditional medicine.



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## Methodology

This study is a review of medicinal plants effective in treating childhood anemia according to Iranian traditional medicine. To gather relevant sources, a search was conducted in reputable scientific databases such as Web of Science, Medline, PubMed, Scopus, SID, and Google Scholar using keywords like "medicinal plants," "anemia," "children," "herbal medicine," and "traditional medicine." Inclusion criteria for the review included original articles in Persian and English, as well as books on traditional and herbal medicine. Exclusion criteria consisted of articles lacking sufficient data for scientific evaluation, duplicate articles, irrelevant studies, and those written in languages other than Persian and English.

## Results

Medicinal plants and nutritious fruits, including *Rumex*, *Urtica*, *Taraxacum*, banana, pomegranate, sesame, tomato, alfalfa, parsley, *Arctium*, raisin, wormwood, bell pepper, strawberry, spinach, date, fenugreek, and lime, play a significant role in preventing and treating anemia in children. These foods are rich in iron, vitamin C, and other essential compounds that support red blood cell production and enhance iron absorption, thereby contributing to the improvement of children's health. Comprehensive information regarding these plants is provided in Table 1.

**Table 1:** Persian Name, Scientific Name, English Name, Plant Family, Used Plant Part, Active Compound, and Mechanism of Action of Iranian Medicinal Plants Effective Against Anemia in Children



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| Persian Name | English Name | Scientific Name | Plant Family | Used Plant Part | Active Compound | Mechanism of Action |
|---|---|---|---|---|---|---|
| Torshak | Sorrel | *Rumex acetosa* L. | Polygonaceae | Leaf | Vitamin C, Iron | Increased iron absorption, enhanced immune system, and reduced inflammation [15]. |
| Gazaneh | Nettle | *Urtica dioica* L. | Urticaceae | Leaf | Vitamin C, Iron | Enhanced red blood cell production, combating anemia, and boosting the immune system [16]. |
| Goleghased | Dandelion | *Taraxacum officinale* F.H. Wigg. | Asteraceae | Leaf | Vitamin A, Iron | Improved liver function, increased iron absorption, and enhanced digestion of food [17]. |
| Mouz | Banana | *Musa* spp. | Musaceae | Fruit | Potassium, Iron, Vitamin B6 | Increased energy, enhanced red blood cell production, and improved cardiovascular health [18]. |
| Anar | Pomegranate | *Punica granatum* L. | Lythraceae | Seed | Tannins, Iron, Vitamin C | Increased iron absorption and enhanced red blood cell function [19]. |
| Konjed | Sesame | *Sesamum indicum* L. | Pedaliaceae | Seed | Calcium, Iron, Vitamin E | Boosting the immune system, aiding iron absorption, and increasing red blood cell production [20]. |
| Younjeh | Alfalfa | *Medicago sativa* L. | Fabaceae | Leaf | Iron, Vitamin K | Strengthening red blood cells and increasing hemoglobin levels [21]. |



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|---|---|---|---|---|---|---|
| Gojeh | Tomato | *Solanum lycopersicum* L. | Solanaceae | Fruit | Vitamin C, Iron | Increased iron absorption and improved digestive system function [22]. |
| Jafari | Parsley | *Petroselinum crispum* (Mill.) Nyman | Apiaceae | Leaf | Vitamin C, Iron | Boosting the immune system and aiding better iron absorption [23]. |
| Babaadam | Burdock | *Arctium lappa L.* | Asteraceae | Root | Inulin, Iron | Strengthening the digestive system, reducing inflammation, and aiding iron absorption [24]. |
| Maviz | Raisin | *Vitis vinifera* L. | Vitaceae | Fruit | Vitamin C, Iron | Strengthening red blood cells and aiding iron absorption [25]. |
| Afsantin | Wormwood | *Artemisia absinthium* L. | Asteraceae | Leaf | Artemisinin | Strengthening the digestive system, aiding nutrient absorption, and boosting the immune system [26]. |
| Felfeldolmei | Bell pepper | *Capsicum annuum* L. | Solanaceae | Fruit | Vitamin C, Iron | Enhancing iron absorption and improving immune and vascular system function [27]. |
| Toutfarangi | Strawberry | *Fragaria ananassa* Duchesne | Rosaceae | Fruit | Vitamin C, Iron | Boosting the immune system, increasing iron absorption, and improving blood circulation [28]. |
| Esfenaj | Spinach | *Spinacia oleracea* L. | Amaranthaceae | Leaf | Vitamin C, Iron | Increasing red blood cell production, boosting the immune system, and reducing inflammation [29]. |



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| | | | | | | |
|---|---|---|---|---|---|---|
| Khorma | Date | *Phoenix dactylifera* L. | Arecaceae | Fruit | Iron, Potassium | Boosting energy production, increasing hemoglobin levels, and red blood cell production [30]. |
| Shanbalileh | Fenugreek | *Trigonella foenum-graecum* L. | Fabaceae | Seed | Vitamin C, Iron | Aiding hemoglobin production, boosting the immune system, and improving digestion [31]. |
| Limotorsh | Lemon | *Citrus limon* (L.) Osbeck | Rutaceae | Fruit | Vitamin C, Iron | Increasing iron absorption, boosting the immune system, and fighting inflammation [32]. |



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| Scientific Name | Picture |
|---|---|
| *Rumex acetosa* L. |  |
| *Urtica dioica* L. |  |
| *Taraxacum officinale* F.H. Wigg. |  |



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| | |
|---|---|
| *Musa* spp. |  |
| *Punica granatum* L. |  |
| *Sesamum indicum* L. |  |
| *Medicago sativa* L. |  |



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| | |
|---|---|
| *Solanum lycopersicum* L. |  |
| *Petroselinum crispum* (Mill.) Nyman |  |
| *Arctium lappa L.* |  |
| *Vitis vinifera* L. |  |



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| | |
|---|---|
| *Artemisia absinthium* L. |  |
| *Capsicum annuum* L. |  |
| *Fragaria ananassa* Duchesne |  |
| *Spinacia oleracea* L. |  |



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| | |
|---|---|
| *Phoenix dactylifera* L. |  |
| *Trigonella foenum-graecum* L. |  |
| *Citrus limon* (L.) Osbeck |  |

The analysis of the table reveals that it includes 18 plant species. These plants belong to 14 different botanical families. The Asteraceae family, with 3 species, is the most frequent. The Fabaceae and Solanaceae families each have 2 species, ranking second. Other families, including Rutaceae, Apiaceae, Polygonaceae, Urticaceae, Musaceae, Lythraceae, Pedaliaceae, Vitaceae, Rosaceae, Amaranthaceae, and Arecaceae, are each represented by one species in the table. Given its higher frequency, the Asteraceae family likely plays a more significant role in the medicinal compounds found in this table.

The plant parts used, broken down by category, include leaves, fruits, seeds, roots, and dried fruits. The most commonly used part is the leaf, with 7 occurrences (39%), followed by the fruit with 6 occurrences (33%). Seeds are used in 3 cases (17%), while roots and dried fruits are each used in 1 case (6%). This indicates that aerial parts of the plants, particularly the leaves, are the most commonly utilized in these medicinal compounds, whereas underground parts or dried fruits are less frequently used.

Iron (Fe) is present in all 18 plants and is considered the most important active ingredient. Vitamin C, found in 14 species, is another major compound. Other compounds, such as Vitamin K and potassium, are observed in 2 species each. Specific compounds like inulin, artemisinin, and tannins are mentioned in 1 species each. This suggests that



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iron and vitamin C are crucial compounds for boosting the immune system, enhancing iron absorption, and offering other therapeutic benefits.

## Discussion

Anemia is a significant public health challenge that affects children and can have detrimental effects on their physical and cognitive development. This condition is commonly caused by a deficiency of iron and other essential nutrients in the diet, leading to symptoms such as fatigue, weakened immune function, and impaired concentration [9]. Identifying and implementing effective strategies for the prevention and treatment of anemia, especially in children, is of paramount importance as it can improve quality of life and contribute to sustainable development [10].

Medicinal plants hold a special place in Iranian traditional medicine for the treatment of anemia due to their natural and safe compounds [13]. These plants are rich in nutrients, including iron and vitamin C, which play a vital role in increasing red blood cell production and improving iron absorption in the body [14]. Utilizing these natural resources not only serves as a suitable alternative to chemical methods but also presents an ideal option for children due to the reduced risk of side effects [13,14].

Studies have shown that plants such as sorrel [15], nettle [16], mallow [17], and fruits like banana [١٨], pomegranate [19], and strawberries [28] effectively contribute to improving anemia in children. These plants and fruits are enriched with iron and vitamin C compounds.

Iron and vitamin C are the key active components in many of these plants, including tomato [22], parsley [23], raisins [25], bell pepper [27], spinach [29], fenugreek [31], and lemon [32]. Vitamin C enhances the body's ability to absorb iron, making it highly effective in alleviating anemia. These two compounds, working synergistically, improve the production of red blood cells and strengthen the immune system [22-28]. The use of medicinal plants containing these compounds not only helps to treat anemia but also improves other aspects of children's health [29-32]. The bioactive compounds and antioxidants present in medicinal plants can effectively help prevent and treat various disorders and diseases, including anemia, cardiovascular diseases, diabetes, and chronic inflammation, by neutralizing free radicals and reducing oxidative stress [33-37].

## Conclusion

While the findings of this study confirm the high potential of medicinal plants in treating anemia in children, further comprehensive research and clinical trials are necessary to confirm the effectiveness and safety of these plants. More studies on dosage, treatment duration, and potential interactions with pharmaceutical drugs could pave the way for more effective applications of these plants. Additionally, increasing parents' awareness of the role of medicinal plants in managing anemia could be an effective step toward reducing the prevalence of this condition in children.

## Statements and Declarations


### Funding support

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### Competing interests

The authors have no competing interests to declare that are relevant to the content of this article.

### Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki.

### Consent to participate

Informed consent was obtained from all individual participants included in the study.

### Author contributions

SN: Conceptualization, the original draft writing, investigation, writing including reviewing and editing and investigation and formal analysis; PP: Conceptualization, supervision, and project administration; PP and SN Conceptualization, the original draft writing, investigation, writing including reviewing and editing


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