Unlocking the Power of Plants: Herbal Remedies for Anemia

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ABSTRACT

This literature investigates the efficacy of herbal remedies in addressing anemia, which is a prevalent blood disorder characterized by insufficient red blood cells to meet the body's physiological demand. Focusing on sickle cell anemia, bone marrow and stem cell diseases, vitamin deficiency anemia, iron deficiency anemia. The study examines causes, symptoms, diagnosis, and conventional treatments. Sickle cell anemia affecting specific population causes recurrent pain, low red blood cells and infections. Diagnosis involves complete blood cell count (CBC) and hemoglobin electrophoresis with treatments ranging from malaria preventions and bone marrow transplantation. The review also determine bone marrow and stem cell problems like aplastic anemia, its diagnosis and its treatment like stem cell transplant and blood transfusion. In addition the conventional treatment is also explain in this review such that herbal remedies like yellow dock root and stinging nettle, dandelion and burdock, alfalfa, spirulina, parsley and dang quai and many others. The importance of spleen-nourishing food meat and beans rich in iron. The study also brief about the ayurvedic treatments like purgation therapy, punarnava mandura and yoga in regulating blood.

Keywords: Anemia, herbal treatment, sickle cell anemia, red blood cells, iron deficiency anemia

INTRODUCTION

Anemia is a condition characterized by a deficiency of healthy red blood cells or hemoglobin, which are responsible for carrying oxygen to the body's tissues[1,2]. This can lead to a range of symptoms, including weakness, shortness of breath, dizziness, and irregular heartbeat. The most common type of anemia is iron deficiency anemia, which occurs when the body lacks sufficient iron to produce hemoglobin[2,3]. Other types of anemia can be caused by factors such as vitamin B12 deficiency, chronic diseases, or blood loss. If left untreated, anemia can lead to complications such as severe fatigue, pregnancy-related issues, and heart problems[3]. It is important to diagnose and treat anemia to prevent these potential health problems. Various factors, including age, sex, and underlying health conditions, can influence the risk of developing anemia[1]. Therefore, it is essential to consider these factors when evaluating and managing the condition.

Hemoglobin

Red blood cells has cardinal protein and a pigment which holds oxygen is hemoglobin[4]. It shares reversible and inconsistent bond with oxygen so when it is in oxygenated form, it is termed as oxyhemoglobin, and colors bright red.

But in its reduced form, it is referred as deoxyhemoglobin and colors purple blue[4,5]. One molecule of hemoglobin has apparently four heme atoms, encircling a globin group. The composition of heme is entirely iron while globin contains mostly polypeptide chain's two linked pairs[6].

Types of Anemia

There are various type of anemia[7]. Majorly these 5 are the types which prevail in the population.

Sickle cell anemia

Bone marrow and stem cell problems

Vitamin deficiency

Iron-deficiency anemia

Other health conditions

Sickle Cell Anemia

The population of US, mainly African Americans, and Hispanic Americans are mostly affected by this genetic disorder[8]. Due to genetic flaw, red blood cells of the body turn out to be in crescent shape resulting in the inadequacy of oxygen into the body's organ because of abrupt collapse of red blood cells[9].

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Sign and symptoms

The primary attributes of sickle cell anemia in young age are supposed to get the following symptoms[10,11].

- Recurring episodes of pain
- Rbc's in lesser number.
- Recurrent infections.

Symptoms arise when RBCs, turn into irregular crescent shape. As they shift into sickle shape, the eventually causes anemia due to the decomposition of these cells in premature state[12].

This fast decomposition resulted in the following emerging symptoms,

- Growth in children is delayed
- Paleness in eyes and dermis
- Weakness

Sickle RBCs which are rigid and inelastic when set down in tiny blood vessel, causes very painful episodes of pain[13]. Lungs, brain, spleen and kidney get affected by these episodes of pain because these episodes, distressed blood with rich oxygen and subsequent tissues[13]. Pulmonary hypertension is the severity of sickle cell anemia which cause elevated blood pressure in the blood vessels which goes from heart to the lungs[14]. Only one third population is affected by this disorder and this can proceed to heart failure[15].

Diagnosis

Diagnosis of sickle cell disease (SCD) involves several tests to identify the presence of abnormal hemoglobin[16]. Further it also determine the severity of the condition. A complete blood count (CBC) is the first step in diagnosing SCD, followed by hemoglobin electrophoresis to identify abnormal hemoglobin, such as sickle cell hemoglobin (HbS) and hemoglobin C (HbC)[17]. Identification of HbS and HbSC can be done through hemoglobin electrophoresis, and confirmation is done by high-performance liquid chromatography (HPLC). Genetic testing is another procedure for diagnosis, but it is not commonly done due to the availability of other tests for detecting HbC and HbS[16]. Chest X-ray and urinalysis may also be performed to detect associated symptoms and infections[17].

Treatment

Malaria prevention is crucial for sickle cell patients and those living in malarial countries, as they are more prone to malaria. Many authorities recommend life-long malaria prophylaxis in people with homozygous sickle cell disease [18,19]. Vaso-occlusive crises, which cause extreme pain, can be treated with pain relievers, particularly opioids, and NSAIDs such as naproxen or diclofenac. Patient-controlled analgesia devices are used to monitor intense crises in patients who need to receive IV opioids. Acute chest crises are treated similarly to vaso-occlusive crises, along with the administration of macrolide and quinolone. Folic acid and penicillin are suggested for children with undeveloped immune systems[20]. Hydroxyurea is a drug that can reduce the intensity and frequency of attacks by replacing hemoglobin S with the reactivation of fetal hemoglobin[20]. Avascular necrosis is treated with joint replacement surgery, pain relief medication, bone grafting, resting the joint, and physiotherapy[18,19]. Bone marrow transplant is the only curative option for SCD, but it is not easy to receive a compatible donor[20].

Bone Marrow and Stem Cell Problems

There are enough stem cells present in bone marrow which ultimately evolve into red blood cells. Anemia results, if due to cancer metastasis, stems cells are replaced by metastasis cells or if stem cells found to be very less and nonfunctioning[21].

Anemia which falls into stem cell problem category includes:

1. Aplastic Anemia

Aplastic anemia is a rare and serious blood disorder that occurs when the body's bone marrow does not produce enough new blood cells, leading to symptoms such as fatigue, weakness, dizziness, and easy bruising[22]. This condition can develop without a specific cause or may be the result of damage to the bone marrow from factors such as radiation, certain chemotherapeutic drugs, or other medications[22,23]. The symptoms of aplastic anemia can vary in severity and may include bleeding, bruising, and an increased risk of infections[22,23]. If left untreated, aplastic anemia can lead to serious complications such as severe blood disorders, heart failure, and arrhythmias[22].

Diagnosis

The condition can be diagnosed through blood tests and bone marrow examinations, and treatment may include medications, blood transfusions, or a stem cell transplant. It is important for individuals experiencing symptoms of aplastic anemia to seek medical attention for proper diagnosis and management[23].

Blood Test

The easy suspect ion of aplastic anemia is when red blood cells, platelets and white blood cells or TLC count is low or very low the standard range[23].

Bone Marrow Biopsy

This process requires a tiny sample of bone marrow from any large bone of the body so hipbone is appropriate. For this purpose a needle is required which extract out a sample from the bone. Then microscope is used for examination of any blood disorders. In case of aplastic anemia, blood cells per stems cells are lesser in number[23].

Treatment

If the patient is not that serious or blood levels are not below average, medication and blood transfusion are appropriate but if the case is severe bone marrow transplantation must be done.

Blood Transfusions

Blood transfusion supply blood cells to the body that bone marrow was not forming at first place. But this is not a legit cure for aplastic anemia, it only cure the symptoms of anemia like bleeding and fatigue[24]. A transfusion consists of, Red blood cells; It comprises of red blood cells. Platelets; It cure the patients from severe bleeding[24].

Stem Cell Transplant

People in crucial state of aplastic anemia can assist by stem cell transplant surgery from the donor. It will help grow bone marrow with stem cells. This transplant which is also known as bone marrow transplant can be done more prominently in people of younger age[25].

Chemotherapy or radiation rays are used to diminish diseased bone marrow. Blood used as a filter for healthy stem cells of the donor. New blood cells start to produce when healthy stem cells are administered into the blood stream via I/V, and they move towards the cavities of bone marrow. Patient need to admit at hospital for a long time period and drugs have been given to avoid any stem cell rejection. That's why it is a risky and complicated process and donor is not that easy to find[25].

Immunosuppressants

These drugs are given to people who are suspected of autoimmune disorders and also having aplastic anemia, so that these suppressants change or repress immune system. Drugs include cyclosporine and anti thymocyte globulin[26]. If the bone marrow is getting destruct by immune cells, these drugs play a role in subduing the action of immune cells. They are widely used in combination. These drugs peeves to be very efficient in curing aplastic anemia, but only the drawback is that these drugs can make immune system more weak and after patient stop having these drugs, anemia my comes back[26].

Bone Marrow Stimulant

Bone marrow stimulants are a type of medication used to boost blood cell counts in conditions such as aplastic anemia. These drugs include colony-stimulating factors such as sargramostim (Leukine), filgrastim (Neupogen), and pegfilgrastim (Neulasta). They work by stimulating the bone marrow to produce new blood cells, helping to address the low blood cell counts associated with aplastic anemia[27].

2. **Thalassemia**

Thalassemia is a genetic condition that affects the production of hemoglobin, a protein responsible for carrying oxygen in red blood cells. It is most commonly found in Africa, the Middle East, and Southeast Asia. The severity of thalassemia can range from mild to fatal, with Cooley's anemia being the most serious condition[28]. Symptoms of thalassemia include deformities in facial bones, weakness, yellow skin, slow growth, dark urine, and swelling in the abdomen. The condition is caused by a mutation in the DNA of cells responsible for forming hemoglobin. Treatment options for thalassemia include medication, blood transfusions, stem cell transplantation, immunosuppressants, bone marrow stimulants, and antibiotics and antivirals[29].

Types of Thalassemia

How much mutated genes patients have taken from parents or mutation occur in which molecule of hemoglobin tells which type of thalassemia is developed[30]. If mutated

genes are in larger number, severity of thalassemia is more.

Alpha Thalassemia

Alpha hemoglobin chains are made up of four parts of genes, and patient will inherit two from mother and two from father[31]. One mutated gene: In this gene, no significant symptoms arise of thalassemia, but patient can inherited to their children because now patients becomes a carrier. Two mutated genes: Mild signs may appear if patients have two mutated genes. Condition termed as alpha thalassemia trait. Three mutated genes: Symptoms becomes severe and moderate. Four mutated genes: If the patient has four mutated genes, conditions will get severe even before birth in the fetus and such babies may die quite soon after their birth. Such babies also need life time transfusion therapy. Rarely, such babies afterward can be treated with stem cell transplant but it is still a risky step[31].

Thalassemia Minor

Beta hemoglobin chain made-up of two genes in this kind. And baby inherit one from mother and one from father. One mutated gene: Person experience mild symptoms. Condition referred as beta thalassemia or thalassemia minor. Two mutated genes: thalassemia major if patient two genes are affected, which is a moderate to severe condition. Symptoms appear when babies enter into their early two years of life but not there at the time of birth. Two mutated genes can also results in thalassemia intermedia[32].

Diagnosis for Thalassemia

Blood Test

Blood tests are used to diagnose thalassemia and can show several characteristics, including low levels of red blood cells (RBCs) with smaller than expected sizes, pale-colored RBCs, variations in RBC size and shape, and a bull's eye appearance under the microscope due to uneven distribution of hemoglobin in RBCs.

Prenatal Testing

Prenatal testing is also available to detect thalassemia in the fetus before birth. Two common methods for prenatal testing are chorionic villus sampling (CVS) and amniocentesis.

Chorionic villus sampling

At 11 week of pregnancy, this sampling test is performed. In this test, small piece from placenta is extract out for evaluating further.

Amniocentesis

Amniocentesis is typically performed at 16 weeks of pregnancy, and fluid surrounding the fetus is taken for sampling. These tests help determine the fetus's genotype and assess the severity of thalassemia.

Treatment

- **Treatments for mild thalassemia**

In mild thalassemia, symptoms are also usually less. So only treatment required is to have blood transfused. Iron excess can result in poeple with severe beta thalassemia when they get their blood transfused. Oral drug is given known as 'Deferasirox' , to eradicate iron overload[33].

- **Treatments for moderate to severe thalassemia**

Frequent blood transfusions; Patient need to have their blood get transfused from time to time , more commonly after every few weeks[33].

Stem cell transplant; An another option for babies born with severe thalassemia is stem cell or bone marrow transplant and also prevent from life time transfusions of blood[34].

Vitamin Deficiency Anemia

RBCs are buildup with the aid of folate and co balamine. So when these two things lacks in the human body, vitamin deficiency anemia bound to happen[35]. It arises two types:

- **Megaloblastic Anemia**: There is vast deficiency of vitamin B9 and vitamin B12 when this anemia occurs[36]. In this type of anemia, mega oblasts are formed by bone marrow which are irregular, unusual by structure and mostly large in size. Symptoms of dyspnea, pain, weakness arise. Some symptoms related to stomach and intestine like appetite loss, nausea, diarrhea, also arises. The deficiency of cobalamin deficiency consequence in psychopathic symptoms, like insensibility in feet and hands. Feeling of pins and needles in feet, loss of sleep, panic disorder and depression. When tape worm found in body, they take all of the carbon and keep body at stake[36]. Diagnosis is clinical evaluation, and blood test[36].

- **Pernicious Anemia**: It is due to poor vitamin absorption. It is a blood disorder rarely present in which body cannot appropriately consume cobalamin, which is the basic

requirement in the formation of red blood cells. There is a protein in stomach, gastric protein called as intrinsic factor, required for the absorption of vitamin B12. Symptoms include, high blood pressure, irregular heartbeat, fatigue, and jaundice etc[37].

Iron Deficiency Anemia

This anemia is due to the insufficiency of iron in the body. Hemoglobin is produced when the iron requirement of bone marrow is fulfilled[38].

Following factors results in production of this anemia:

- Vegetarians, infants, children lack the rich in iron.
- Depletion of iron happen in breast feeding and pregnant women due to the metabolic needs.
- Time to time donation of blood.
- Training to bear pain.
- Menstruation cycle.
- Drinks containing caffeine, some foods and drugs.
- Crohn's disease.

Can be cured by taking more iron. Or iron each diet.

Epidemiology

47% of preschool infants have a chance of anemia across the board. Approximately 400 types of anemia have been discovered, and 24.8% of the world's population encounters anemia.

Herbal Treatment of Anemia

By Using Herbs

Yellow Dock Root

This wild herb grows on the roadside of the European countries, containing many phytonutrients in a great proportion, like anthraquinonoid glycosides alongside with tannins, oxalates and resins but it is not very rich provenance of iron. Vitamin A, C calcium and phosphorus is also present in adequate amount[39].

Stinging Nettle

Urtica dioica has been actively consumed by anemia patients over years. It is also useful in eradicating sodium contrnt from body. Useful especially when person exhaust mentally or physically[40]

Dandelion and Burdock

Taraxacum officinale and artium lappa (botanical name) shows synergistic effect when taken in combination in curing patients with anemia. It has an ability to improve the absorption of iron more proficiently from the dietary food[41].

Alfalfa

Due to its revitalizing and analeptic effect, it is a very excellent herbal supplement[42].

Spirulina (blue-green algae)

A teaspoon full of spirulina per day can help treating and effectively curing symptoms of macrocytic and microcytic anemia[43].

A drink of Gentian (Gentianalutea)

Gentianalutea can be taken as single spoon in 3 glass of water and take before meal. This herb has a very good activity to absorb iron from gastric tract[44].

Avocado (Persea americana)

The most nutritious, juicy, smooth, luscious, and pleasant tasting fruit originates from America which is also full of nourishment. It can be taken after surgery or after every meal as it composes of sufficient amount of iron[45].

Parsley and Dang quai

Both herbs are considered to be very effective in the treatment of anemia but also has blood thinning characteristics so not given to patient who are going to have a surgery[46].

Ginseng and Codonopsis Root

These two roots provide supporting treatment in curing anemia when given with spirulina or any other herbs[46].

Watercress

It is valuably one of the most ancient and nautical green leafy vegetable plant. It has an exceptional source of calcium, magnese, vitamin A,C ,riboflavin, vitamin B6 and possess more iron as compare to spinach, more vitamin C than oranges and more calcium than the dietary milk. It is safely consumed plant for having very less amount of toxic metal so it is very reliable herb in maintaining iron content in body. When watercress in supplement form is taken, plasma lutein and plasma carotene specifically elevates by 100% and 33% respectively[47]

Ash Gourd (Benincasa hipsida)

Benincasa hipsida is used in managing condition called as hematuria where in urine hemoglobin is found. It also reduced the chance of getting anemia in case of piles by examining loss of blood from nose or lungs[48].

Fenugreek (Trigonella foenum graecum)

Trigonella foenum graecum are widely spread an Indian cuisine. It is basically very helpful for girls soon after they become anemic when menstruation begins. The leaves it contain has ability of maintaining blood volume in body. Traditionally known as methi[49].

Wormwood (Artemisia absinthum)

Artemisia absinthum is an effective herb in treating anemia conditions[50].

Celery (Apium graveolens)

Alium graceolens when taken in diet or meal eat can built up iron and magnese content in the body. So ultimately blood levels and hemoglobin levels increases in the body [51].

Chicory (Chichorium intybus)

Chichotium intybus is the best blood stimulant and shows remarkable consequences if combine in diet with parsley and celery. In form of salad it can be taken and be very efficient in treating anemia[51].

Spleen Nourishment

Natural treatment for anemia involves around getting spleen nourish because that is a basic organ for the formation of red blood cells[52].

Squash Foods, are considered as the prime group, following with the all-orange colored foods, pumpkins, spaghetti squash, butternut squash, acorn. People with anemia should eat any of the fruit once daily to get the spleen nourished.

Leafy Vegetables Group include all the basic food components that made up spleen nourishing requirement and red blood cell formation. Vegetables like, sauteed spinach, kale, kle caesar salad, chard once a day as they are rich in nutrioution[53].

Bitter Foods Group involves all bitter but healthy for spleen foods like lettuce, arugula sald, romaine, bitter herbs[54].

Consume Meat and Beans Rich in Iron

To eliminate anemia and its symptoms the very next step is to start consuming healthier option rich with iron in diet which can get from sea food and meat. Chicken liver and beef liver has very high amount of iron in it and helps rejuvinating liver. A diet containing liver in some amount along with vegetables such as onions, celery, carrpts and sea salt makes a perfect meal full of healthy and nutritious diet. Other organic meat options like lamb, beef, mutton is very beneficial and healthy. Raw homemade Burger of meat or chicken along with spinach leaf in it can reduce anemia and provide better health conditions. Nuts ,grain products,cereals,nuts,bread,contain non heme iron and is very beneficial for people suffering with anemia[55].

Ayurvedic Treatment for Anemia

Ayurvedic treatment system believed that for the cure of anemia pirgation therapy is much necessary. In this therapy, constipation is firstly relieved before starting any therapy for anemia. In this therapy they give Punarnava mandura. Punarnava is ayurvedic medicine in tablet form which balances kapha and pitta. It has iron oxide in it so it is useful in treating anemia, dermatitis, hemmerrhoids. Triphala, also an ayurvedic medicine containing chebulagic, chebulinic and gallic acid is prescribed to elevate the blood proportiom in body[56]

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