

## A REVIEW OF IRON DEFICIENCY ANEMIA

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**ABSTRACT:** Iron deficiency anemia is the most prevalent type of anemia which occurs as a result of iron deficiency in nutrition, excessive loss of blood (as in gastric bleeding) or iron mal-absorption. Iron deficiency is the most prevalent form of mal-nutrition in the world which has afflicted about 2 billions of people. In developing countries, it is rapidly on the rise. Even in developed countries where other forms of mal-nutrition have been basically eradicated, this problem continues to be. It can be due to insufficient amount of iron in food or lack of gastric absorption in order to make up for the blood which is lost through menstruation. Its daily amount required in body is very little and is about 1 milligram, though its required amount varies among people in accordance with their age, sex and physiological status. The most common symptoms of anemia are premature fatigue, burn-out, weakness, pale skin, irregular or high heart rate, short breaths, sore chest, feeling of lightness in head, minor dizziness, cognitive problems, numbness or coldness in the ending parts of body organs and also headache. For adult males, an amount of hemoglobin less than 13 gr/dl is considered as a sign of anemia. For adult females this amount is 12 gr/dl. Generally, physicians prescribe a complete blood count test among primary tests of diagnosing anemia, as well as curing gastric problems, constipation and reformation of eating habits (such as the consumption of inedible materials like ice or soil) which are other symptoms of iron deficiency. Visiting doctors and nutrition specialists can be effective in an early prevention and treatment of anemia. There are several ways of treating anemia, the best and the least risky of which that is always used is consuming oral supplements. Treatments using simple iron salts such as oral Iron(II) sulfate are really effective and are in the form of tablets, capsules or liquids which have to be taken for a couple of months. If taken once the stomach is empty they can be better absorbed. Vitamin C enhances iron absorption. Therefore, consuming vitamin C is often recommended along with iron. For children, iron and its derivatives are available as syrup or iron drops prescribed in accordance with their weight and their bodily needs.

### INTRODUCTION

Anemia is derived from the Greek term *an-haima* implying *bloodless*. It refers to the qualitative or quantitative defects of hemoglobin which is a molecule inside red globules of blood. Hemoglobin is in charge of transporting oxygen from lungs to body tissues. Therefore, anemia can lead to the occurrence of hypoxia or the lack of oxygen in body tissues and organs(1). Since body cells need oxygen to live on, diverse degrees of anemia can lead to various clinical conditions. Blood is made of blood cells and a fluid called plasma(2). Three types of blood cells are floating in plasma. White blood cells (white globules): These cells resist against infections. Platelets: these cells help the production of blood clots after injuries as well as the red globules which contain hemoglobin. Hemoglobin is a protein containing iron which is the main construct of the red color of blood. This material is the primary factor for transporting oxygen from lungs to other body parts (3). It also transfers carbon dioxide from body tissues to lungs to be repelled through exhale. Many blood

cells including red globules are permanently produced in bone marrow. In order to produce red globules and hemoglobin, body needs the consumption of protein-rich foods, vitamins and iron(4).

### IRON DEFICIENCY ANEMIA

Iron deficiency anemia is the most prevalent form of anemia caused by iron deficiency in nutrition, excessive blood loss in the long run (as in gastric bleeding) or mal-absorption of iron. Iron deficiency is the most common form of mal-nutrition worldwide(1). About 2 billions of people are afflicted with it. Iron deficiency anemia (insufficiency of blood red globules as a result of iron deficiency) is highly prevalent in developing countries(2). However, even in developed countries, where other forms of mal-nutrition have been basically eradicated, this problem prevails. Iron deficiency is not the only cause of anemia. However, whenever anemia has been prevalent iron deficiency has been its most prevalent cause. Iron deficiency anemia is the most common

among 6-24 month children and women at the reproductive age. It is often seen among men and the elderly. It occurs when the absorbed amount of iron is not sufficient for meeting daily needs (5).

### **PREVALENCE AND CAUSES**

Iron deficiency anemia happens as a result of inadequacy of iron in food or the lack of its gastric digestion in order to make up for the iron lost through menstruation. Iron is a main part of hemoglobin combination. Its shortage would cut down on the entrance of hemoglobin into red globules. In the U.S., 20% of women at the reproductive age, compared to 2% of adult men are afflicted with iron deficiency (6). The main cause of iron deficiency anemia among women is blood loss through menstruation. Iron deficiency without anemia among teen girls would negatively affect their academic achievement and IQ. Iron deficiency is the most prevalent form of the lack of a vital element in the world. Iron deficiency anemia can also be due to the bleeding wounds made to the gastric system(7). The daily amount of bodily need of this element is low and about 1 milligram. However, this requirement varies in accordance with individuals' age, sex and physiological conditions. For instance, pregnant women require more iron due to an increase in the amount of blood loss, growth of the fetus and other tissues. Among infants that are breast-fed, in case the mother is healthy, the amount of iron existing in mother's milk is sufficient for the first 4-6 months within birth (5). However, after the 6<sup>th</sup> months of birth iron drops are recommended. For children consuming powdered milk, often there is no deficiency of iron. For infants whose weight is less than expected upon birth, iron supplies are usually less and 3 months after birth they would need to be fed extra iron through iron drops (2). Furthermore, premature cutting and clamping of cord connector increases the risk of iron deficiency since it deprives the infant from one-third of its whole blood(8).

### **SYMPTOMS**

The most important symptom of anemia is premature fatigue and burn-out. Other symptoms include:

Weakness and paleness, irregular heart rate, short breath, sore chest, feeling of lightness in head or mild dizziness, cognitive problems, anesthesia, numbness or coldness in the ending parts of body organs, headache (9).

At the beginning, anemia can be so mild that might be imperceptible. However, the

intensity of symptoms would increase as correlated with the development of anemia(10).

### **DIAGNOSIS**

Physicians generally recommend a complete blood count test among the first diagnostic tests of anemia. Besides the count of red globules and the amount of hemoglobin, the automatic counting machine measures the number of red globules via a flow cytometer which is a key factor of differentiating different causes of anemia (11). The blood smear test using a microscope is also beneficial. In developed countries 4 factors are measured: red globule count, hemoglobin size, Mean Corpuscular Volume (MCV), Red Cell Distribution Width (RDW) (1, 4). It helps to yield the counts of hematocrit, mean hemoglobin of each red globule and mean concentration of hemoglobin in each red globule(12). It could be compared to the natural values for each age group and sex. Some counters would explicitly measure hematocrit. For adult males, an amount of hemoglobin less than 13 gr/dl is the sign of anemia while for women this value is less than 12 gr/dl (13).

If the source of blood loss is known, blood production assessment can help us to find out whether bones are capable of making up for the blood which is lost or not. When the source is not known, the physician could ask for further tests such as Erythrocyte Sedimentation Rate (ESR), measurement of ferritin, iron of the serum, transferrin, folate of serum, vitamin B12 of serum, hemoglobin electrophoresis, kidney functioning test (such as measurement of serum creatinine) (5, 14). In case the diagnosis is hard, bone marrow aspiration test can reveal the status of productive fundamental cells of red globules(2).

### **PREVENTION**

Consuming iron-rich foods(15)

Consuming nutritious sources of vitamin C in each meal for a better absorption of iron (e.g. orange, grape fruit, tomato, cabbage, strawberry, green pepper, lime)(16).

Adding red meat, fish or chicken to one's daily diet(15)

Refraining from drinking tea, coffee with or immediately after one's meal (16).

Removing gastric problems and constipation(17)

Correction of improper eating habits (such as the consumption of inedible materials such as soil or ice) which are the symptoms of iron deficiency(15, 16)

Consultation with a physician and nutrition specialist for early prevention or treatment of anemia(18)

Consumption of bread made of swollen dough(15)

Consumption of such nuts as dried berries, plum, fig and raisin which are rich sources of iron(15)

Consuming cereals and newly-grown grains(19)

Washing and disinfecting vegetables(20)

Washing hands completely with water and soap before eating and after toilet (19, 20)

Daily consumption of an iron tablet from the end of the 4<sup>th</sup> month of pregnancy to 3 months after delivery among pregnant women(15, 18)

Consuming iron drops simultaneously with the use of supplementary feeding, up until the end of 2 years of age among children(15, 18)

#### **FACTORS INCREASING IRON ABSORPTION AND ITS NUTRITIOUS SUPPLIES(3):**

Citric acid and ascorbic acid or vitamin C that exist in plum, melon, rheum, mango, pear, cantaloupe, cauliflower, vegetables, orange juice, lemon, lime, apple and pineapple increase the absorption of iron in body.

Malic acid and tartaric acid existing in carrot, potato, beetroot, pumpkin, tomato, cabbage and turnip do also lead to an increased absorption of iron.

Such fermented products as soya sauce are included among these factors.

#### **TREATMENT**

In order to treat anemia there are a couple of ways among which the best and the least risky are used. The best and the least risky is to consume oral supplements. Treatments using simple iron salts such as oral Iron (II) Sulfate are truly effective (21). They are in the form of tablet, capsule or liquid whose consumption should take a couple of months. In case these tablets are taken while the stomach is empty, their absorption would be better and faster. However, in this case it would lead to gastric stimulation and problems (22). Such gastric side effects caused by iron consumption as nausea, upset stomach, throbbing heart, diarrhea and constipation can be minimized if iron is taken to a little extent and only gradually added to until it reaches the required amount. Iron tablet had better be taken late at night before going to sleep so that its side effects are kept to minimum(23). Vitamin C increases iron absorption. For the same reason, taking vitamin C is recommended to be accompanied by iron (24). Moreover, besides medical treatment attention should be paid to the amount of iron in

food that is absorbable (22). Absorption of food iron is often influenced by the form of the iron in it. The iron existing in animal proteins such as beef, fish and bird meat (heme iron) is absorbed more while the absorption of plant iron such as that of vegetables and fruit (non-heme iron) is less (25). It should be reminded that vitamin C would increase iron absorption in vegetables and fruit (non-heme iron). Drinking tea along with or immediately after meal can reduce iron absorption for 50% (2) (26).

#### **CONCLUSION**

Iron deficiency anemia is the most prevalent type of mal-nutrition in the world which has afflicted about 2 billions of people. However, the extent to which it is required depends on age, sex and physiological status. For example pregnant women require higher amounts of iron due to an increased blood volume and the growth of the fetus, placenta and other body tissues (2, 27). The most important symptoms of anemia are premature feeling of fatigue and burn-out, weakness and paleness of skin, irregular or fast hear rate, short breaths, sore chest, feeling of lightness in head, mild dizziness, cognitive problems, numbness or chill at the tips of body organs, and headache (28).

Generally, physicians recommend a complete blood count test as the initial tests of diagnosing anemia. All the following are among ways to prevent or improve anemia: Consumption of food supplies rich with vitamin C in each meal for a better absorption of iron (e.g. orange, grape fruit, tomato, cabbage, strawberry, green pepper, lime), adding red meat, fish or chicken to daily diet, refraining from drinking tea or coffee with or immediately after meal, solving gastric problems and constipation, correcting wrong eating habits (e.g. eating inedible materials such as soil, ice) which is one symptom of iron deficiency anemia, consulting with a doctor or nutrition specialist, consuming bread made of swollen dough, eating nuts such as dried berries, plum, fig and raisin which are rich sources of iron, using cereals and newly-grown grains, washing and disinfecting vegetables, washing up one's hands before preparing and eating food and after the toilet, a daily consumption of an iron tablet since the end of the 4<sup>th</sup> pregnancy month through three months after delivery among pregnant women (21, 29, 30). There are several ways of treating anemia the best and least dangerous of which is using oral supplements. Treatment using such simple iron salts as oral Iron (II) sulfate is very effective(3). It is in the form of a capsule, tablet or liquid whose consumption should go on for a

couple of months. In case these tablets are taken with an empty stomach, they would be better and faster absorbed. Vitamin C helps the absorption of iron. Therefore, consuming vitamin C is recommended to be accompanied by iron (30). However, besides medical therapy, attention should be paid to the absorbable amount of iron in food. Absorption of food iron is often affected by the form of iron in it (2). The iron existing in animal proteins such as beef, fish and bird meat (heme iron) is absorbed better while that in plant proteins such as vegetables and fruit (non-heme iron) is less in amount. It needs to be reminded that vitamin C increases the absorption of iron in vegetables and fruit (non-heme iron) (26).

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