

## Case Report

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## Iron is the Most Common Nutritional Deficiency!

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**Received** December 22, 2015; **Accepted** January 03, 2016; **Published** February 15, 2016

**Citation:** Hala Youssef (2016) Iron is the Most Common Nutritional Deficiency! Int J Nutr Sci & Food Tech. 2:1, 42-43

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**Causes of iron deficiency:** Inadequate dietary intake, increased demands due to pregnancy or growth or, increased blood losses (menses, haemorrhage or trauma).

**Affected groups:** Adolescents (particularly menstruating girls), pregnant women or those of childbearing age, infants and older people.

Symptoms include fatigue, shortness of breath and vertigo.

**Lab tests:** Haemoglobin and serum ferritin are the most common ways to detect anaemia. Haemoglobin concentrations below 13 g/dl for adult males, 12 g/dl for menstruating women and 11 g/dl in pregnancy are considered indicative of anaemia.

1. Haemoglobin and Haematocrit confirm the presence of anaemia
2. Bone marrow Iron and Serum ferritin to evaluate iron status and Iron stores.
3. Serum transferrin receptor concentration, Transferrin saturation, free erythrocyte protoporphyrin, Red blood cells indices, and Serum iron to detect Iron supply.

### Iron in the diet:

The average iron content of a typical western diet is about 10–15 mg, of which only 10–15% is absorbed.

Haem iron is highly absorbed, ranging from 8 to 40%. Haem iron

is provided by foods of animal-origin (i.e. red meat and meat products, liver, kidneys, egg yolk, fish, chicken, etc.).

**Haem iron** absorption is higher in the presence of meat, by a mechanism still under investigation. Also, calcium chloride directly inhibits haem iron, counteracting the enhancing effect of meat. This inhibitory effect is dose-related, a dose below 40mg does not have an inhibitory effect, while maximum inhibition is reached with intakes around 300 mg.

Heat treatment and storage can transform haem iron into non-haem iron, resulting in the lower absorption of iron from certain foods.

**Non-haem iron**, which is only absorbed by 0.5–6%, is very abundant in vegetable foods and in fortified foods (i.e. dried fruits and vegetables, wholegrain cereals, legumes and fortified bread and cereals).

However, the availability of non-haem iron is low. Its absorption is inhibited by the presence of phytic acid and polyphenols. Phenolic compounds found in spices and herbs (e.g. chilli, garlic, pepper, shallot and turmeric) are potent inhibitors of iron availability, reducing iron availability from 90 to 20% in a dose-dependent manner. Conversely, caseinophosphopeptides improve iron absorption by increasing its solubility or by diminishing other interactions with its minerals. Also, vitamin A and C enhance iron availability, thus counteracting the action of polyphenols and phytic acid.

Enhancers of Iron absorption:	Inhibitors of Iron absorption:
Haem iron	Non-haem iron
Acids (HCl, vitamin C)	Anti-acids
Amino acids, carbohydrates	Phytic and phosphate acids
Iron-deficiency anaemia	Tea, coffee
Pregnancy	Iron overload
Infancy	Infections
Adolescence	Gastrectomy
Hereditary haemochromatosis	Low levels of gastric acids

**Advice to Patients:**

1. Include food items with high iron content daily
2. Consume sources of vitamin C in every meal, to enhance iron absorption
3. Consume food items with haem iron in every meal if possible
4. Avoid the consumption of large amounts of tea and coffee, especially with meals, as they inhibit iron absorption
5. Consume up to three cups of milk or yogurt daily, but not with foods rich in iron.
6. If Iron supplements are needed, they are to be taken with a full glass of water or food.

Strict vegetarians may need to take in higher levels of iron, but be careful, because high levels of Iron may be toxic. The maximum safe dose for adults and adolescence is 45 mg a day. Children under age 14 should take no more than 40 mg a day.

Starting at 4 months of age, breastfed infants should be supplemented with 1 mg/kg per day of iron. This should continue until iron-containing complementary foods, such as iron-fortified cereals, are introduced in the diet.

Also at 4 months of age, partially breastfed infants (more than half of their daily feedings as formula or milk) who are not receiving iron-containing complementary foods should receive 1 mg/kg/day of supplemental iron.