

Role of Iron Deficiency in Chronic Hair Loss

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Abstract

Anemia is a condition in which you lack enough healthy red blood cells to carry sufficient oxygen into the tissues of your body. Anemia can make you feel weak and tired. Iron deficiency anemia is the most common form of anemia, which occurs when there is not enough mineral iron in your body. To generate hemoglobin your body needs iron. If your blood supply doesn't have enough iron, the rest of the body can't get the amount of oxygen it needs. Hair is a fast-proliferating organ with a high blood supply requirement. The length and size of the hair depend on the hair cycle anagen, growth stage. At the center of these systems, however, lies the blood supply in the scalp, the oxygen delivery system, and nutrients that are provided to the subcutaneous blood flowing hair follicles. It is not yet clear what role iron plays in hair loss. This research had the purpose of determining the relationship between iron and hair loss. Iron hair loss deficiency may look like traditional hair loss patterned by males and females. A study published in the Journal of Korean Medical Science found that iron may not only play a role in hair loss, but may also cause hair to fall out in a manner similar to genetic baldness of male and female patterns. The aim of the study is to analyse the role of iron deficiency in chronic hair loss. Most widely cited nutritional causes of hair loss include iron, one of the key micronutrients in metabolism of our body. This review gives a clear knowledge about the different roles played by iron deficiency in the body, specifically its role in chronic hair loss.

Keywords: Anemia, iron deficiency, nutritional, hair loss, alopecia

Introduction

Iron is a trace factor essential for various metabolic functions in cells. Because iron is toxic in excess, tight control is required to prevent iron deficiency (ID) or iron overload¹. The adult body has an iron content of 3–4 g². The standard western diet contains approximately 7 mg iron per 1000 kcal; however, each day it is usually only absorbed in 1–2 mg³. The usual Western diet contains about 7 mg of iron per 1000 kcal, but normally only 1–2 mg is absorbed every day⁴. There are two forms of iron in

the human diet: heme iron and nonheme iron. Heme iron is meat-derived, and is well absorbed. Anemia is defined by the World Health Organization as blood hemoglobin values below 7.7 mmol / l (13 g / dl) in men and 7.4 mmol / l (12 g / dl) in women⁵. Usually a full blood cell count, peripheral smear, reticulocyte count, and serum iron indices are used in the anemia cause assessment. The severity of anemia depends on the amount of hemoglobin / hematocrit in the patient⁶. Microcytic, hypochromic erythrocytes and weak iron stores define iron deficiency anaemia⁷. The mean corpuscular volume is the measure of the total volume of red blood cells, and mean concentration of corpuscular hemoglobin is the measure of hemoglobin concentration in a given volume of packed red blood cells⁸. Standard reference ranges for mean corpuscular volume are 80–100 fL, and mean concentration of corpuscular hemoglobin is 320–360 g / l⁹. Poor iron bioavailability of the diet is the primary cause of iron deficiency anemia in developing countries^{10,11}; however, reduced iron absorption and blood loss

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account for the more likely iron deficiency etiologies in developed countries^{8,12}. Reduced absorption of iron may also be the result of atrophic gastritis or malabsorption syndromes especially celiac disease¹³. Postoperative gastrectomy (partial or total) and intestinal resection or bypass can also lead to secondary iron deficiency anemia through reduced iron absorption¹⁴. Chronic blood loss from genitourinary, gynecological, or gastrointestinal tracts accounts for the bulk of iron deficiency anaemia causes¹⁵. Excessive menstruation is the most common etiology of iron deficiency anaemia in premenopausal women¹⁶. Hair is a fast-proliferating organ with a high blood supply requirement¹⁷. The length and size of the hair depend on the hair cycle anagen, growth stage. At the center of these systems, however, lies the blood supply in the scalp, the oxygen delivery system, and nutrients that are provided to the subcutaneous blood flowing hair follicles¹⁸. It is not yet clear what role iron plays in hair loss¹⁹. This research had the purpose of determining the relationship between iron and hair loss. Iron hair loss deficiency may look like traditional hair loss patterned by males and females. A study published in the Journal of Korean Medical Science found that iron may not only play a role in hair loss, but may also cause hair to fall out in a manner similar to genetic baldness of male and female patterns.

CONSEQUENCES OF IRON DEFICIENCY ANEMIA IN HAIR GROWTH

Hair Loss

Hair loss is one of the most common aesthetic problems among the world's population, with 50% of men and almost 50% of women over the age of 50 suffering from this blemish²⁰. Despite being part of the natural aging process, which also affects the scalp, it can negatively affect the quality of life of each individual, with situations that can lead to a state of psychological distress and demoralization. It is important to understand whether hair loss comes within the context of Normal physiological process, or otherwise, if an abnormal process is Complication caused by problems relating, for example, to Scalp or bulb to the scalp. The definition of all hair loss types, baldness and alopecia is often complex and reductive, since they are always the result of several causes that lead to the emergence of these pathologies²¹.

Androgenetic alopecia is one of the most common causes of men's hair loss, which can be traced back to androgenic hormone activity and Dysfunction of 5-alpha-reductase enzyme leading to increased hair weakness. In women androgenetic alopecia is one of the main causes, but due to the reduced presence of androgens, the incidence is extremely minor²². Negative chemical and physical treatments applied to women's scalp are responsible for hair weakening which often leads to hair loss. Conversely, in spring and autumn, the common causes which can be associated simultaneously in men and women thinning hair are different, such as the so-called seasonal hair loss.

Even this phenomenon should be kept under control, albeit temporary, so as not to compromise any already critical situations. Other common causes which undermine normal hair function are

Also related to insufficient and unbalanced dietary intake, deficits in critical trace elements, genetic factors, hormonal imbalances or adverse activities that may change the hair growth cycle equilibrium^{23,24}. Modern nutrients and some food supplements that are advertised will help the patient mitigate and reduce hair loss, compensating for future changes and nutritional shortages that may accentuate or worsen hair loss in the long run. Food supplements are often used to enhance hair growth although scientific studies do not always support the correlation between the use of specific components and the prevention of hair loss²⁵. In addition, the use of different vitamins and minerals for hair loss treatment is often based on traditional practices or commercial grounds, and several Nutrients are inserted into the composition of dietary supplements to comply with the rule "one size fits all". In fact, some elements are traditionally known to play a significant role in hair physiology, while others are often present in the composition of certain food supplements without sufficient scientific evidence to support their use. Non-pathological hair loss diagnosis includes a detailed review of each individual's nutritional deficiencies to restore the hair's biological functions and achieve normal physiological conditions.

Iron Deficiency

Iron deficiency anemia arises when the iron intake balance, iron stores, and iron loss from the body is

insufficient to fully support erythrocyte production²⁶. Iron deficiency anemia seldom causes death although there is a major effect on human health. The condition is quickly diagnosed and managed in the developed world but is still ignored by the doctors²⁷. In comparison, in underdeveloped nations it is a health issue that affects significant parts of the population. Overall, worldwide, particularly among underprivileged women and children, the prevention and effective treatment for iron deficiency anemia remains dreadfully inadequate. Iron-related erythropoietic demands are produced by three variables: tissue oxygenation, erythrocyte turnover and hemorrhage loss of erythrocytes²⁸. In the absence of hemorrhage, illness, or altered physical activity, the tissue oxygenation requirements and erythrocyte development usually remain constant throughout adulthood. Around 20 mL of senescent erythrocytes are cleared daily, and the 20 mg of iron in those cells is recycled for new erythrocyte production. Due to a shorter half-life of iron deficiency anemia circulating erythrocytes, iron is recovered in these patients earlier but the amount of iron in each microcytic erythrocyte is reduced²⁹. Iron deficiency anaemia is usually associated with low iron saturation of the transferrin available. Iron is loaded from three sources onto diferric transferrin: gut (diet), macrophages (recycled iron), and liver (stored ferritin iron)³⁰ Overall, before the host develops anemia, iron stores are reduced or lost. The demands for erythrocytes must therefore be met by dietary and erythrocyte-recycled iron. If iron losses occur, the newly developed erythrocytes may decrease hemoglobin, resulting in a reduction in the amount of iron supplied by the same number of senescent erythrocytes. In children and other classes, 30 percent – 50 percent of anemia is caused by iron deficiency³¹.

As 1.6 billion people are anemic³², several hundred million demonstrate anemia for iron deficiency. As such, the iron deficiency is the world's most severe cause of anemia. Iron deficiency anemia affects a subset of the two billion nutritionally iron deficient people worldwide³³. Hence the iron deficiency health burden can be extrapolated from the global incidence of anemia. Anemia is not distributed evenly across the globe, as underdeveloped geographies are fivefold increasing. The prevalence of anemia among young children in some global regions is > 50 percent, and even approaches 100 percent in some places³⁴. In the

same regions, with the exception of nonelderly men, 40 percent -50 percent of the population remains anemic at all ages. By comparison, in developed nations the burden of the disease is far less. In the United States, the incidence of anemia caused by iron deficiency in all age groups and gender groups is reduced³⁵. About 10 million people in the United States, however, are iron deficient, including 5 million people with iron deficiency anaemia. The clinical spectrum of signs and symptoms for this disorder is largely dependent on the severity of the anemia. The hemoglobin values used to define anemia vary by age, sex, race and whether the blood was sampled from the capillary (finger stick) or venous (phlebotomy) source³⁶. In the absence of automated testing, it has been shown that portable devices or hemoglobin color visual matching are 95 percent accurate to classify the hemoglobin level within 1–2 g / dL of reference values^{37,38}. Patients can be complaining about poor mental performance or cold intolerance³⁹. Fatigue and associated exercise dyspnea are recorded regularly. Though rare at presentation, glossitis or dysphagia may be identified^{40,41}. Recognition of such characteristics can trigger appropriate laboratory tests and therapy.⁴²

Relationship Between Iron Deficiency And Hair Loss

Loss of scalp hair is not a life-threatening condition which can cause psychiatric discomfort and adversely affect the quality of life. Hair is a rapidly proliferating organ with a lot of blood supply requirements. The association between micronutrients and hair loss has thus been tested in many studies since the 1960s. The most widely cited hair loss nutrition causes include iron, which is one of our body's key micronutrients in metabolism. It is well known from its diverse functions that iron deficiency is linked to many pathological conditions. The role in hair loss however is not yet well known. Reviewing articles documenting the relationship between ID and hair loss including female hair loss pattern (FPHL), telogen effluvium, alopecia areata, alopecia universalis or totalis, some⁴³ advocated the association between ID and hair loss and others opposed it. Serum ferritin level may be used as a very early marker to detect the ID. It is a major iron-binding protein in non erythroid cells that reflects storehouses of total body iron. It declines as iron reserves decline from the

very early stage of ID⁴⁴. Since only ID can induce quite low serum ferritin (FC) concentration, an ID specific FC is very common. However, it can play a role as a reactive protein in inflammation, patients with active infection and/or inflammation should not be included in the analysis when we consider that FC is used to detect IDs.

Hormonal status can affect hair loss, and should also be taken into account when interpreting the clinical condition. In previous research, the mean level of ferritin and transferrin concentration in patients with diffuse telogen hair loss was statistically slightly smaller than in non-hair loss subjects (16.3+/-12.6 vs. 60.3+/-50.1, ng / mL; P<0.0001 and 20.3+/-9.7 vs. 28.3+/-11.8 percent; P=0.006, respectively). Total iron binding potential in patients was also slightly higher than in control group (367.8+/-58.2 vs. 319.2+/-60.1 microg / dL; P=0.004). For nine iron deficiency anemia patients (Hb < 12 g / dL), eight patients reported telogen hair loss (odds ratio: 10.5, 95 percent CI: 1.2-90.7; P=0.013); At serum ferritin levels, the odds ratio (95 percent confidence interval) for diffuse telogen hair loss was 21.0 (4.2-105.0). Women with an iron deficient status are at risk for loss of telogen hair. More evident is the essential role of serum ferritin in hair loss. Serum ferritin levels below or equivalent to 30 ng / mL are closely associated with telogen hair loss in women with no systemic inflammation or any other underlying disorders⁴⁵. This research had the purpose of determining the relationship between iron and hair loss.

Conclusion

From the above review we can analyse that iron deficiency plays an important role in the body. Iron deficiency anemia arises when the iron intake balance, iron stores, and iron loss from the body is insufficient. Though loss of scalp hair is not a life-threatening condition it can still cause psychiatric discomfort and adversely affect the quality of life. From the above study we can conclude that iron plays an important role in the body, specifically in chronic hair loss.

Acknowledgement: I would like to thank the Department of General Pathology, Saveetha Dental College and Hospitals, Chennai for their valuable support in this study.

Conflict of Interest: The authors declared that there

is no conflict of interest.

Source of Funding : Self

Ethical Clearance: Not required

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