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The Role of Vitamins and Minerals in Hair Loss

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ABSTRACT

Hair loss is one of the most common dermatological complaints among the global population, with 50% of men and nearly 50% of women experiencing pattern hair loss by the age of 50. Patients with hair loss often ask whether nutritional supplements will help them regrow their hair or prevent it from falling out. Hair follicles are among the most metabolically involved in the body, and hair grows in a variety of ways. may be impacted by calorie and micronutrient deficiency, the links are complex.

In this study, we discuss the function of vitamins and minerals in non-scarring alopecia, including vitamin A, vitamin B, vitamin C, vitamin D, vitamin E, iron, zinc, and selenium. We looked at the research on the normal levels and daily dietary requirements of the most common micronutrients, as well as their role in the hair follicle cycle and treatment of hair loss .We looked at 90 articles published in the English language in the last 30 years that looked at the relationship between vitamins and minerals and hair loss, and we used PubMed and Google Scholar to search them. Micronutrients, such as vitamins and minerals, are essential, but their role in hair follicle function is not fully understood. Such a deficiency.

1. INTRODUCTION

Vitamins and hair growth are often intertwined. This is because vitamins help to kick-start healthy hair development. This is why most hair regrowth products have enough vitamins to get the job done.

Hair loss is one of the most common aesthetic issues among the world's population, with 50% of men and nearly 50% of women over the age of 50 suffering from this flaw [1]. Despite being a common part of the aging process that often affects the scalp, it can have a detrimental impact on each individual's quality of life, with circumstances that can lead to psychological distress and demoralization.

It's crucial to know whether hair loss is a natural physiological process or an uncommon complication triggered, for example, by scalp or hair bulb issues. Hair loss, baldness, and alopecia are all classified in a nuanced and reductive manner because they are often the result of several factors that lead to the onset of hair loss these pathologies. [2].

Given customer marketing campaigns, physicians must be able to reply with a review of the available evidence. It's worth noting that such supplements are not without risk. Supplementation can be detrimental to hair in the absence of a deficiency. Overdosing on some nutrients, such as selenium, Vitamin A, and Vitamin E, has been attributed to hair loss [3,4,5]. Despite the fact that patients find these items to be beneficial, there is no evidence to support their use [6]. Furthermore, there have been records of hair loss worsening as well as liver toxicity. [7].

Despite the fact that such items contain a range of nutrients, a study of the medical literature reveals that there is no evidence to support their use. Most of what we know about the impact of nutrients on hair loss comes from disease states that cause deficiency. There is currently a scarcity of research on the effects of supplementation in people who are not deficient in any nutrients. In this paper, we assessment te to be had literature on nutrient deficiencies that bring about hair loss, element the threat factors for those deficiencies, and assessment the to be had proof of the outcomes of supplementation, each useful and adverse, on hair loss.

The aim of this study was to look into the potential links between hair loss and nutrients, focusing on minerals, vitamins, and other elements that can help prevent and minimize hair loss.

1.1 Vitamin A

Vitamin A is a group of compounds that includes retinol, retinal, retinoic acid, and provitamin A carotenoids. It is a fat-soluble vitamin. The active type is retinoids. Retinoids are commonly found in animal-derived foods (eggs, chicken, fish, and meat). Carotenoids can be found in leafy greens, orange and yellow fruits, and nuts. Development, vision, epithelial differentiation, immune function, and reproduction are all aided by vitamin A. Xerophthalmia with night blindness is the most common symptom of vitamin A deficiency. [8].

Normal levels

The retinol RDA for adults is 3,000 IU for men and 2,300 IU for women [9]. The most popular method for determining vitamin A status is to measure serum retinol concentration. Other techniques, such as dose response tests and isotope dilution assays, are used to assess vitamin A reserves in the liver, although they are not practical to use on a regular basis. Vitamin A deficiency is characterized as a retinol serum level of less than 20 micrograms per deciliter. [10].

Causes of deficiency

Vitamin A deficiency is uncommon in developed countries, but it is still a problem in developing countries, especially in areas where food is scarce. Vitamin A deficiency can be caused by a variety of causes, including malnutrition and fat malabsorption. Long-term supplementation and oral retinoid treatments may cause hypervitaminosis A. [11].

Vitamin A and hair

Dietary vitamin A has been shown to stimulate hair follicle stem cells in murine studies [12], though its role is complex and precise levels of retinoic acid are needed for optimal hair follicle function” [13]. Although vitamin A deficiency hasn't been related to hair loss, high levels have. In reality, in a mouse AA model, researchers discovered that lowering vitamin A levels in the die actually delayed hair loss onset [13]. There is genetic evidence that the alfa retinoid nuclear receptor forms a dimer with Vitamin D receptor and plays a major role in controlling hair cycling [14]. Retinoids are essential for anagen initiation, and vitamin A deficiency

causes epidermal interfollicular hyperplasia, keratinocyte hyperproliferation, and aberrant terminal differentiation, as well as a skin inflammatory response. [15].

Vitamin A deficiency causes ichthyosis-like skin changes and is often associated with telogen effluvium and fragility of the hair [16,17].

In clinical practice, Iatrogenic retinoid-induced hair loss is common. Retinoids have been shown to inhibit the development of hair shafts during anagen and trigger premature catagen. [18].

Telogen effluvium can occur with isotretinoin therapy (mostly in doses over 0.5 mg/kg/24 h) [19]. This usually happens after 3 to 8 weeks of treatment and goes away after 6 to 8 weeks. Telogen effluvium, on the other hand, is more popular with acitretin treatment at doses of 25 mg or more per day [20]. Isotretinoin-induced telogen effluvium may also be due to a decrease in biotinidase activity. [19,21].

Treatment recommendations

In vitamin A deficiency, a single dose of 200,000 IU is given by mouth every 4-6 months [22]. Telogen effluvium in the course of systemic isotretinoin treatment has a benign reversible nature and usually requires no treatment.

1.2 VITAMIN B

The vitamin B complex contains eight water-soluble vitamin substances that help in cell metabolism: thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), vitamin B6, biotin (B7), folate, and vitamin B12. With the exception of biotin, which is the only B vitamin provided by the body, the prescribed daily allowances for these vitamins can be met by consuming a well-balanced diet.

In healthy individuals biotin does not need to be supplemented [23]. Only riboflavin, biotin, folate, and vitamin B12 deficiencies have been associated with hair loss.

BIOYIN

Biotin is a water-soluble vitamin known as a B-complex vitamin and is an essential nutrient. Biotin is a necessary cofactor for the proper functioning of carboxylation enzymes. Diet is the primary source of biotin, which is found in foods such as egg yolk, cereals, and vegetables.

Dietary biotin appears to be 100 percent bioavailable, according to research. It can also be synthesized by normal intestinal microflora, but it is unknown how much this source contributes to the biotin status^[24]. Biotin proteolysis is used to break down proteins. In this step, biotinidase is a crucial enzyme. Biotinidase deficiency is a genetic condition that can be diagnosed by newborn screening. ^[24].

Normal levels

For healthy adults, the daily recommended amount of biotin is 30 micrograms. Meat, fish, eggs, seeds, nuts, and some vegetables, such as sweet potatoes, spinach, and broccoli, all contain biotin. ^[25].

Causes of deficiency

Medications are one of the reasons. Certain medications, such as intravenous (IV) feeding, may prevent your body from properly absorbing vitamins. You can develop a B-7 deficiency if you get your nutrients through an IV or tube. Long-term dieting, biotinidase deficiency, and intestinal issues Other hereditary factors, such as Extreme dermatitis, dry skin, and seborrheic dermatitis are examples of cutaneous findings , fungal infections, macular rash, fine and brittle hair and hair loss ^[26].

Biotin and hair

Biotin is a necessary cofactor for the proper functioning of carboxylation enzymes. It has been shown that a lack of it can cause skin rashes, conjunctivitis, and alopecia. Biotin deficiency is uncommon since intestinal bacteria may produce enough of it. ^[27].

Treatment recommendations

Early diagnosis of biotin deficiency and prompt initiation of oral biotin therapy (5-10 mg per day) are the most critical aspects of medical treatment for patients with biotin deficiency. When puberty begins, some experts recommend rising the dosage to 15-20 mg per day.

1.3 Vitamin C

Vitamin C is a water-soluble micronutrient that is essential for good health. It's a powerful antioxidant that's needed for the biosynthesis of collagen, specifically procollagen triple helix, as well as catecholamine synthesis. [28].

Humans are deficient in an enzyme called L-gulonolactone oxidase, which is needed for vitamin C synthesis, and should therefore supplement their diet with vitamin C. Vitamin C levels are especially high in citrus fruits, potatoes, tomatoes, green peppers, and cabbages. [29].

Although vitamin C deficiency is typically associated to body hair abnormalities there are no data correlating vitamin C levels and hair loss [30].

Normal levels

The recommended daily dose of vitamin C for adults is 65 to 90 milligrams (mg), with a maximum of 2,000 mg per day. Although too much dietary vitamin C is unlikely to be harmful, megadoses of vitamin C supplements might cause: Diarrhea. Nausea [25].

Causes of deficiency

The principal cause of deficiency is the minimal consumption of fruits and vegetables [31]. The clinical presentation of Vitamin C deficiency is scurvy, with skin manifestations due to decreased and altered collagen production. [32,33].

Vitamin C and hair

Vitamin C is an essential cofactor in the enzymatic step forming collagen and in supporting the cross-linking of keratin fibers. Moreover, it is a potent water-soluble antioxidant, helpful in contrasting the oxidative stress responsible of the hair follicles degeneration. [34,35].

Treatment recommendations

The recommended treatment for Vitamin C deficiency is 300-1000 mg daily of oral vitamin C for 1 month [36,37].

1.4 VITAMIN D

Vitamin D is a fat-soluble vitamin that belongs to the steroid hormone family and is essential for calcium homeostasis as well as musculoskeletal health .

Exogenous vitamin D can be derived from fatty fish, fish liver oil, egg yolk, and certain mushrooms. ingested as well as cutaneous produced vitamin D needs 2 hydroxylation steps, first in the liver, turning into Calcidiol or 25-hydroxyvitamin D, and then in the kidneys to turn into its active metabolite, Calcitriol or 1,25- (OH) 2 D [38].

Vitamin D regulates keratinocyte growth and differentiation by binding to the nuclear vitamin D receptor (VDR). VDR is immunoreactive in murine hair follicle keratinocytes, with the highest activity in the anagen stage. Hair loss in patients with vitamin D-dependent rickets type II demonstrates the importance of vitamin D in the hair follicle. Vitamin D resistance and coarse body hair are common in these patients, who have mutations in the VDR gene. Complete scalp and body alopecia are common. In addition, Forghani et al. discovered two patients with inherited vitamin D-resistant rickets and alopecia due to novel nonsense mutations in the VDR gene. [39].

Normal levels

The normal range of vitamin D is measured as nanograms per milliliter (ng/mL). Many experts recommend a level between 20 and 40 ng/mL. Others recommend a level between 30 and 50 ng/mL.

Causes of deficiency

A deficiency in vitamin D can result from inadequate exposure to sunlight, inefficient production in the skin, not enough vitamin D in your diet, and health conditions that can affect it including, gastrointestinal disorders, renal diseases, and liver diseases

Vitamin D and hair

Women with inadequate or deficient serum vitamin D levels are more likely to develop FPHL than women with adequate levels, suggesting that low vitamin D levels may play a role in the etiopathogenesis of this hair loss pattern.

Serum vitamin D2 levels in a study of eight females with either TE or FPHL were shown to be significantly lower than in 40 age-matched

female controls, with decreased levels correlating to increased disease severity [40].

Treatment recommendations

People with normal serum level of 25(OH) D are advised to take a supplement containing 800 IU of vitamin D per day to maintain a normal level [41,42]. D2 (ergocalciferol) and D3 (cholecalciferol) are available as dietary supplements. Both seem to be effective in preventing or treating vitamin D deficiency.

Since D3 has a longer half-life, it may be necessary to dose less frequently. Vitamin D2 and D3 supplements should be taken with a fat-containing meal to ensure optimum absorption. [43].

There are no universally accepted treatment recommendations for vitamin D deficiency and insufficiency. According to a new study, vitamin D3 is preferable to vitamin D2. [44]. One time dose of vitamin D3 of at least 300,000 IU is most effective in improving vitamin D status for up of 3 months. However, depending on the degree of Vitamin D deficiency, the most common mode of supplementation is a weekly dose of 50,000 IU (cholecalciferol) for 1-3 months. To avoid recurrent deficiency, a daily maintenance dose of 800 to 2000 IU or more will be needed. [41,44].

Vitamin D topical analogues have been tested in mice with congenital alopecia with positive response [45]. In human studies, topical calcitriol has shown to prevent alopecia induced by chemotherapy agents (paclitaxel and cyclophosphamide) [46].

1.5 VITAMIN E

Immune cells are particularly vulnerable to oxidative stress. They also develop reactive oxygen species as part of their immune defense system, which can lead to lipid peroxidation. Antioxidant supplementation significantly improves the number of total lymphocytes and T-cell subsets, reversing many age-related immune deficiencies, elevated levels of interleukin-2, increased natural killer cell activity, enhanced antibody response to antigen stimulation, improved antibody response to antigen stimulation, decreased prostaglandin synthesis, and reduced lipid peroxidation [47].

Vitamin E is involved in the oxidant/antioxidant balance and helps to protect against free-radical damage [48]. Ramadan and colleagues evaluated the serum and tissue vitamin E levels in 15 subjects with AA and found

significantly lower levels of vitamin E in patients with AA than in the healthy controls ($p < 0.001$) [49]. These results were not confirmed by Naziroglu and Kokcam who found no statistical difference in plasma vitamin E levels between patients with AA and healthy controls [48].

Normal levels

The vitamin is stored in adipose tissue, liver, and muscle. The reference range of vitamin E in adults is 5.5-17 $\mu\text{g/mL}$. In children, it is 3-18.4 $\mu\text{g/mL}$.

Causes of deficiency

Vitamin E deficiency is very rare in healthy people. It is almost always linked to certain diseases in which fat is not properly digested or absorbed. Examples include Crohn's disease, cystic fibrosis, and certain rare genetic diseases such as abetalipoproteinemia and ataxia with vitamin E deficiency (AVED).

Vitamin E and hair

Deficiency has no known link to hair loss. But Limited information on effects of vitamin E supplementation improving hair growth in absence of deficiency.

Supplementation in one study of twenty-one volunteers suffering from hair loss has showed significant increase in hair number compared to placebo [50].

Treatment recommendations

If there are neurologic deficiencies or if the deficiency is due to malabsorption, oral vitamin E is administered in high doses. Vitamin E deficiency causes red blood cell fragility and neuron degeneration, especially in peripheral axons and posterior column neurons.

1.6 IRON

Iron deficiency is the most common nutritional deficiency in the world, and it leads to TE [51,52]. Iron is involved in many important physiologic processes and is used in the structure of many molecules in the body, including enzymes, cytochromes, and transcription factors. It can regulate DNA synthesis in dividing cells and acts as a catalyst in oxidation-reduction reactions. Since serum ferritin is one of the most sensitive and precise indicators of iron deficiency, it is the gold standard test for

determining iron stores. It's linked to total iron reserves and intracellular ferritin. [53,54].

The importance of important amino acids in anemia is well understood, but how amino acids influence iron absorption is still being studied. Furthermore, the effect of amino acids on hair growth has yet to be determined. L-bioavailability lysine's is mainly limited to fish, meat, and eggs. Little is known about the influence of L-lysine on iron uptake and utilization. In one study, some of the participating women achieved a modest increase in serum ferritin level after iron supplementation, i.e., supplementation with elemental iron 50 mg twice daily; adding L-lysine (1.5–2 g/day) to their existing iron supplementation regimen resulted in a significant ($p < 0.001$) increase in the mean serum ferritin concentration. [53,55].

Normal levels

Adult women's normal levels range from 35.5 to 44.9 percent, while adult men's levels range from 38.3 to 48.6 percent. These figures can change as you get older. Hemoglobin is a protein that carries oxygen in the body. Anemia is described by hemoglobin levels that are lower than average. [55,56,57].

Causes of deficiency

The most common nutritional deficiency in the world is iron deficiency. Iron deficiency anemia was found in 1 to 2 percent of adults in the Third National Health and Nutrition Examination Survey (NHANES III; 1999-2000). Iron deficiency without anemia was observed in 9-16 percent of females aged 12-49 years, with non-Hispanic American women having two times the rate. The prevalence of iron deficiency in males aged 16-69 years was 2% [58].

Menstrual failure and pregnancy are the most common causes of iron deficiency anemia in premenopausal women, although gastrointestinal blood loss and malabsorption are the most common causes in men and postmenopausal women. [54].

Iron and hair

It's unknown how much ID plays a role in hair loss. Although the mechanism by which iron affects hair growth is unknown, hair follicle matrix cells are among the most rapidly dividing cells in the body, and ID's function as a cofactor for ribonucleotide reductase, the rate-limiting

enzyme for DNA synthesis, can contribute to hair loss. [59].In addition, multiple genes have been identified in the human hair follicle [60],and some may be regulated by iron [61].In a mouse model, reversal of ID led to restoration of hair growth [62].

Treatment recommendation

The recommended oral daily dosage of elemental iron for the treatment of iron deficiency in adults is 150-200 mg/day. It comes in the form of ferrous sulfate, gluconate, or fumarate and can be taken orally. The fumarates improve the bioavailability of elemental iron per tablet (33 percent of elemental iron, versus 20 percent and 12 percent for sulfate and gluconate respectively) [58]. However, there is no proof that one is superior to the others. Sulfates are the least well tolerated because they can cause stomach upset and constipation.

1.7 Zinc

Zinc is an essential mineral required by hundreds of enzymes and multiple transcription factors that regulate gene expression [63]. Although the exact mechanism of action is unknown, zinc's function as an integral component of multiple metalloenzymes involved in protein synthesis and cell division is one possibility. [64].Another possibility is zinc's role in the Hedgehog signaling pathway [65], a critical component in the pathways that govern hair follicle morphogenesis [66].

Zinc deficiency can be hereditary or acquired, and it can affect a wide range of organ systems. Diarrhea, immunological symptoms, and a delay in wound healing are also possible side effects. It's possible that you'll experience changes in your sense of taste and smell. Acral and periorificial dermatitis are two skin symptoms, while TE and brittle hair are two hair changes.

Acrodermatitis enteropathica is an autosomal recessive disorder that causes reduced zinc absorption, whereas malabsorption syndromes like inflammatory bowel disease may cause acquired zinc deficiency[67].or following gastric bypass surgery. Other groups at risk include patients with malignancy, those with liver or renal dysfunction, pregnant women [68], and patients with alcoholism [69].Drugs that can affect zinc levels include valproic acid [70] and certain antihypertensives [71].

Normal levels

RDA for zinc is 11 mg and 8 mg per day for men and women respectively . The lower limit of normal (morning) fasting plasma zinc has been set at 10.7 mmol/L (700 mg/L) [72].

Zinc and hair

Zinc plays a role in a variety of metabolic processes and cellular functions, as well as contributing to the development of keratin, which makes up 95% of the hair structure. Zinc is a potent inhibitor of hair follicle regression and speeds up the regeneration of hair follicles. [73].

Serum zinc, the most widely used indicator of zinc deficiency, can be influenced by a variety of factors, and the functional effects of deficiency can be seen before serum levels fall below average [74]. Screening in those with risk factors is indicated, as hair loss due to zinc deficiency can be reversed. A case series demonstrated reversal of hair loss following oral supplementation in five patients with TE and zinc deficiency [75].

A study of 312 patients with AA, male pattern hair loss (MPHL), FPHL, or TE showed that all groups had statistically lower zinc concentrations as compared to 30 healthy controls [76].

In patients with AA and low serum zinc levels, supplementation has been shown to have therapeutic effects [77]. However, there is currently little research on the impact of zinc supplementation on hair growth in people who do not have a known zinc deficiency. A single patient with alopecia who did not have a strong deficiency improved after taking oral zinc therapy, according to one study. [78].

Causes of deficiency

Acrodermatitis enteropathica, an inherited disorder of zinc absorption caused by a mutation in a zinc transporter, has been linked to severe zinc deficiency in patients receiving parenteral nutrition without sufficient zinc intake [79]. Inadequate food uptake, intestinal malabsorption syndromes, and pregnancy may all contribute to zinc deficiency. Long-term alcohol intake is linked to decreased zinc absorption and increased zinc excretion in the urine. [80].

Avoidance of red meat by young women can be a cause of concomitant iron and zinc deficiency [81]. The first source of zinc from diet is red meat; other good sources are beans, nuts, crab and lobster. Phytates present in cereals and legumes inhibit the zinc absorption [82]. Cutaneous manifestations present as impaired wound healing and an increased

susceptibility to infections, paronychia, periorificial dermatitis, diffuse alopecia [83].and hair color and texture changes [84].

Treatment recommendations

Adults with clinical zinc deficiency should take zinc supplements that are two to five times the recommended dietary allowance. Zinc, along with vitamins C and E and beta-carotene, has been shown to delay the development of intermediate and advanced age-related macular degeneration.

Zinc can be supplemented using several forms such as zinc gluconate, zinc sulfate and zinc acetate with different elemental zinc contribution[85].There are no data about the differences in the efficacy.

1.8 SELENIUM

Selenium is a trace element that is essential for the synthesis of over 35 proteins. The antioxidant enzyme glutathione peroxidase requires selenium as a co-factor. Selenium deficiency is common in low-birth-weight babies and people who need complete parenteral nutrition (TPN). It may also happen to people who live in an area where the soil is deficient in selenium. [86].

In a clinical study of ovarian cancer patients undergoing chemotherapy, selenium supplementation resulted in a substantial reduction in hair loss and other gastrointestinal symptoms as compared to controls. Ingestion of selenium is a supporting factor in chemotherapy, according to the authors[87].

Normal levels

Plasma selenium levels should be between 60 and 150 ng/mL. Selenium deficiency (serum concentration 40 ng/mL) is uncommon, but it is linked to a reduction in glutathione peroxidase activity. Dietary selenium deficiency is common in hospitalized patients or those who receive TPN.

Causes of deficiency

Causes are to blame. Patients with significantly impaired digestive function, those on complete parenteral nutrition, those who have had gastrointestinal bypass surgery, and those who are elderly are all at risk (i.e., over 90). People who eat food grown in selenium-deficient soil can be susceptible to deficiency.

Selenium and hair

In animal studies, rats deficient in selenium display sparse hair growth [88], while knockout mice lacking specific selenoproteins exhibit progressive hair loss after birth, ultimately leading to almost total alopecia [89].

Clinical symptoms of selenium deficiency in a young child included dry skin and sparse, light-colored hair, which improved after supplementation. [90].

Treatment recommendations

There is no research on the impact of selenium supplementation on hair growth in the absence of a deficiency.

Selenium deficiency treatment Increased dietary intake, selenium supplementation, or a combination of the two is needed to correct low selenium levels. If the deficiency is serious, healthcare professionals can prescribe selenium supplements made from sodium selenite or l-selenomethionine.

2. LITERATURE REVIEW

Micronutrients in hair loss

Corresponding author: Dr. Leonardo Espinoza-Benavides

In this article the author talk about the role of approximately the function of micronutrients for the hair follicle feature and the mechanisms via way of means of which deficiency may want to lead to hair loss. And communicate approximately Telogen effluvium and alopecia areata have been related to decrease iron, zinc and nutrition D degrees. Androgenetic alopecia has been related to decrease iron and nutrition D degrees. Both decrease and improved nutrition A degrees can end result in telogen effluvium, however decrease degrees are related additionally with hair breakage. Vitamin C insufficiency consequences in hair shaft abnormality (cork screw hairs). No data exist about hair loss associated with abnormal biotin levels.

Diet and hair loss: effects of nutrient deficiency and supplement use

Corresponding author: Rajani Katta

In this article the author talk about more than one nutrient deficiencies might also additionally bring about hair loss screening for such deficiencies have to be guided via way of means of the records and bodily exam. Nutrient deficiencies might also additionally rise up because of genetic disorders, scientific conditions, or nutritional practices. If danger elements are identified, then laboratory screening for nutrient deficiency can be indicated. In sufferers with hair loss, however with none acknowledged danger elements for nutrient deficiency, laboratory trying out for nutrient deficiency isn't required. There may be very restricted studies at the position of nutrient supplementation withinside the absence of deficiency. Despite this, sufferers regularly are looking for nutrient dietary supplements as a remedy for hair loss. In fact, direct-to-customer marketing and marketing promotes using dietary supplements for hair loss, and many such products, containing a huge kind of formulations, are effortlessly to be had for purchase.

3. RESULT

Our results show that the role of micronutrients for the follicle function and therefore the mechanisms by which deficiency could lead on to hair loss aren't completely understood. Empiric treatments of hair loss conditions without confirmed deficiencies haven't shown utility

There are few studies addressing the connection between hair loss and folic acid or vitamin B12 , but the shortage of in depth studies precludes any recommendation for vitamin B12 or folate screening or supplementation.

Hypervitaminosis A causes hair loss, and data on the consequences of isotretinoin in hair loss support this association.

vitamin C intake is crucial in patients with hair loss related to iron deficiency. There are not any data to support the role of vitamin E in AGA or TE.

Telogen Effluvium/Androgenetic Alopecia Although a relationship between vitamin D levels and AGA or TE remains being debated, most authors agree in supplementing vitamin D in patients with hair loss and vitamin D deficiency.

Iron deficiency is common in females with hair loss, and most authors agree in supplementing iron in patients with iron deficiency

and/or low ferritin levels. However, there's no consensus on “normal ferritin” levels, and most authors prescribe supplements to the patient when the ferritin level is ≤ 40 ng/dL. L-lysine supplementation is suggested for vegan individuals with iron deficiency.

Data correlating TE and AGA with zinc level aren't homogenous, and screening for zinc isn't recommended. Selenium toxicity and riboflavin deficiency can cause hair loss. However, comprehensive studies are lacking, which preclude any recommendation for screening of selenium or riboflavin.

Biotin deficiency causes hair loss, but there are not any evidence-based data that supplementing biotin promotes hair growth. Moreover, exogenous biotin interferes with some laboratory tests, creating false negative or false positive results.

4. CONCLUSION

Food supplements or normal vitamin and mineral intake, combined with a healthy lifestyle and a well-balanced diet, will contribute to everyone's well-being. Stress and unhealthy lifestyles, in combination with genetic disorders, hormonal imbalances, and other diseases, play a significant role in hair physiology and scalp imperfections.

In the absence of deficiency, there is very little research on the function of nutrient supplementation. Despite this, patients often seek nutrient supplements as a hair loss treatment. Physicians must inform their patients of the lack of scientific evidence for these items. Although hair loss can be caused by a variety of nutritional deficiencies, screening for these deficiencies must be driven by the patient's medical history and physical exam. Genetic abnormalities, medical conditions, and nutritional habits may all cause nutrient deficiencies. A discussion of the possible toxicity of some of these supplements is also important. Oversupplementation of certain nutrients can cause a variety of side effects, while oversupplementation of others, such as vitamin A, vitamin E, and selenium, can cause hair loss.

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