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Original research article

Correlation between hemoglobin, serum ferritin levels with hair loss among adults

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Abstract

There are numerous studies which have established the role of low hemoglobin and serum ferritin levels in hair fall. However, in a country like India where the prevalence of anemia is high in general population, we need to analyse whether the same number is also affected by hair fall. In this study we tried to analyze the percentage of apparently healthy individuals with low hemoglobin, low serum ferritin levels and whether all those with low levels of hemoglobin and ferritin are also suffering from hair fall. Apparently healthy adults (defined as the absence of history and symptoms suggestive of chronic diseases and acute medical symptoms such as fever, vomiting, and diarrhoea) attending the Dermatology OPD and willing to participate in the study were included in the study if they fulfilled the defined criteria. Total number of participants was 100. In the study, out of 65 hair loss patients 39 (60%) had normal level of hemoglobin and 26 (40%) had low hemoglobin level. Among 35 participants without hair loss, 25 (71.42%) had normal hemoglobin and 10 (28.57%) had low hemoglobin level. In the study, out of 65 hair loss patients 25 (38.46%) had normal serum ferritin level and 40 (61.53%) had lower serum ferritin level. Among 35 participants without hair loss 17 (48.57%) had normal serum ferritin level and 18 (51.42%) had lower serum ferritin level.

Keywords: Hemoglobin, serum ferritin levels, hair loss

Introduction

Hair loss is a common problem among both sexes and all age groups. Hair loss can influence ones physical as well as psychological well-being. Number of patients presenting with hair loss has been rising steadily and poses quite a challenge for dermatologists to elicit the cause and treat accordingly. The condition has several causes and the most common ones being Telogen effluvium and androgenic alopecia [1].

Telogen effluvium describes an excessive shedding of telogen hair as a result of alteration in the hair-growth cycle with premature conversion of anagen follicles to telogen follicles. This is usually seen with hormonal fluctuations or abnormalities, endocrine disorders, postpartum, physiological, and metabolic stress, drugs, weight

loss, nutritional deficiencies, acute and chronic systemic illnesses, surgeries and scalp inflammation [2].

Androgenic alopecia describes a gradual reduction in the duration of anagen, a prolongation of the "latent phase" of the hair cycle and progressive miniaturization of hair follicle which is predominantly determined by genetic factors and effect of androgens in males. However, in females it is a manifestation of significant androgen excess due to an underlying endocrine disorder [3].

Iron is a critical element in the functioning of all cells, although the amount of iron required by individual tissues varies during development. The major role of iron in mammals is to carry oxygen as part of haemoglobin [4]. It also acts as a cofactor for ribonucleotide reductase of hair growth stem cells which is the rate limiting enzyme for DNA synthesis. The depletion of iron could prevent proper functioning of this enzyme resulting in inhibition of proliferation. Inhibition of other iron-dependent enzymes, such as stearyl CoA desaturase present in the human hair follicle could contribute to hair loss [5]. Iron stores in the body exist primarily in the form of ferritin. The concentration of serum ferritin is positively correlated with the total body iron stores in the absence of inflammation. Iron stores are depleted during evolution of iron deficiency, even before serum iron and erythrocytes are significantly affected. Hence a low serum ferritin value reflects depleted iron stores, but not necessarily the severity of the depletion as it progresses [6]. Hemoglobin concentration can provide information about the severity of iron deficiency if used along with other measures of iron status like serum ferritin [7, 8].

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Methodology

Apparently healthy adults (defined as the absence of history and symptoms suggestive of chronic diseases and acute medical symptoms such as fever, vomiting and diarrhoea) attending the Dermatology OPD and willing to participate in the study were included in the study if they fulfilled the defined criteria. Total number of participants was 100.

Inclusion criteria

1. Apparently healthy adults aged 19-40yrs willing to participate in the study.

Exclusion criteria

1. History of any systemic illness, fever, communicable illness in the previous 6 months.
2. Received iron supplementation in the last 6 months.
3. Pregnancy & lactation.
4. Dermatosis affecting the scalp skin.

Method of collection of data

- Apparently healthy adults willing to participate in the study were enrolled after obtaining written informed consent.
- A predesigned proforma was given to all participants and demographic and other personal details were collected.
- Participants were enquired about the history of presence or absence of hair loss.
- In those who had hair loss, meticulous history was taken regarding the duration of hair loss, progression of hair loss and history of increased hair shedding/hair thinning/poor hair growth.
- Participants with history of abrupt, rapid and generalized hair shedding were considered as having telogen effluvium. History for eliciting precipitating factors was also noted in such patients. Hair shedding persisting for longer than 6 months was considered as having chronic telogen effluvium. Gradual diffuse hair loss with thinning of central scalp or widening of central parting line was considered as having FPHL. Participants with frontoparietal/ frontotemporal recession and vertex thinning were considered as having male pattern hair loss.
- Complaints of hair loss in the family members were noted in all participants.
- General physical examination and systemic examination were done to rule out underlying systemic illness.
- Scalp examination was done in each participant and visual assessment of distribution of clinically evident hair loss was done to diagnose telogen effluvium, female pattern hair loss and male pattern hair loss.

Clinical tests: Hair pull test was done in study participants. A group of approximately 60 hairs was gathered between the thumb and forefinger of the non- dominant hand. With the dominant hand the strands of hair were loosely twisted to remove stray hairs and then the hairs were grasped between the dominant thumb and forefinger near the scalp. Gentle traction was applied in a smooth, gradual manner, away from the scalp. The hair pull test was performed at the vertex, 2 parietal areas and the occipital area of the scalp. If more than 5% hairs were pulled away from scalp, it constituted a positive hair pull test. Microscopic examination of the pulled hair was done whenever necessary.71

Results

Table 1: Hemoglobin levels between those with and without hair loss

		Hair loss	
		Present (n=65)	**Absent (n=35)**
Hb (g/dL)	Normal	39 (60%)	25 (71.42%)
	Low	26 (40%)	10 (28.57%)

In the study, out of 65 hair loss patients 39 (60%) had normal level of hemoglobin and 26 (40%) had low hemoglobin level. Among 35 participants without hair loss, 25 (71.42%) had normal hemoglobin and 10 (28.57%) had low hemoglobin level.

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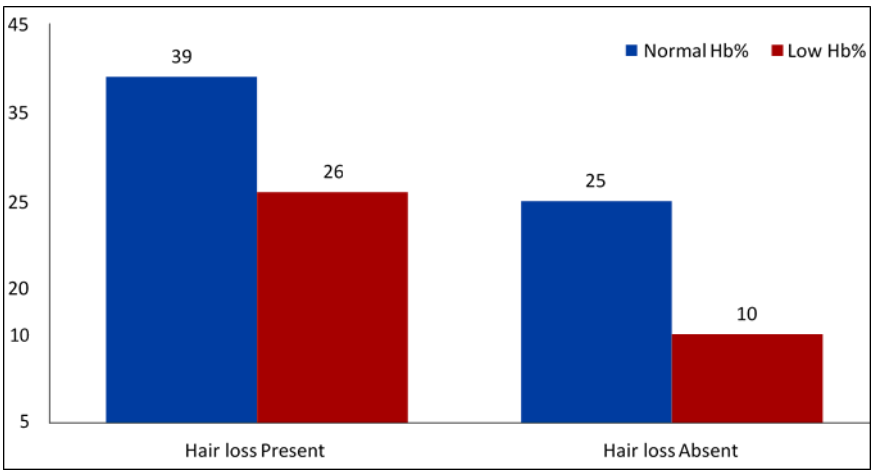

Fig 1: Bar diagram showing normal and lower hemoglobin levels among subjects with and without hair loss

Table 2: Serum ferritin levels between those with and without hair loss

		Hair loss	
		Present (n=65)	**Absent (n=35)**
Serum Ferritin	Normal	25 (38.46%)	17(48.57%)
	Low(≤40µg/L)	40 (61.53%)	18 (51.42%)

In the study, out of 65 hair loss patients 25 (38.46%) had normal serum ferritin level and 40 (61.53%) had lower serum ferritin level. Among 35 participants without hair loss 17 (48.57%) had normal serum ferritin level and 18 (51.42%) had lower serum ferritin level.

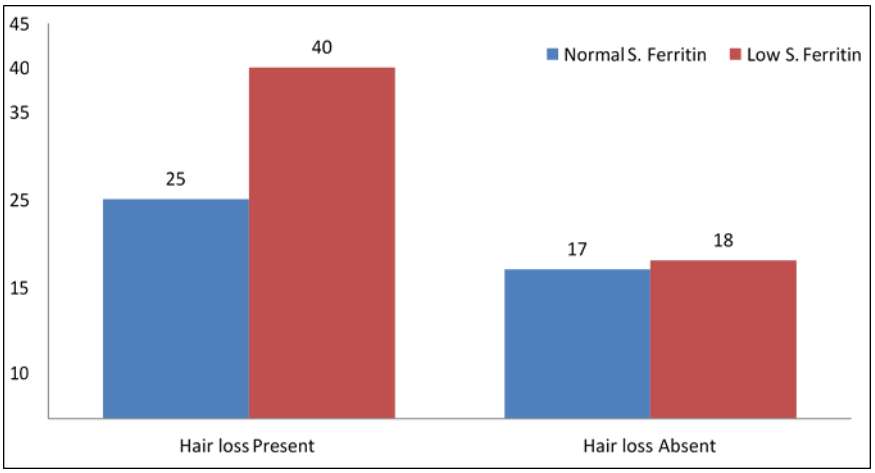

Fig 2: Bar diagram showing normal and lower serum ferritin levels among subjects with and without hair loss

Table 3: Peripheral smear findings between those with and without hair loss

		Hair Loss			
		Present (n=65)		**Absent (n=35)**	
		Count	**%**	**Count**	**%**
Peripheral smear	Dimorphic Anemia	1	1.5%	0	0.0%
	Microcytic Hypochromic Anemia	15	23.1%	5	14.3%
	Normocytic Hypochromic Anemia	5	7.7%	1	2.9%
	Normocytic Normochromic Blood Picture	44	67.7%	29	82.9%

$\chi 2 = 3.021$, df = 3, p = 0.388

Among those with hair loss, 67.7% had Normocytic Normochromic Blood Picture, 23.1% had Microcytic Hypochromic Anemia, 7.7% had Normocytic Hypochromic Anemia and 1.5% had Dimorphic Anemia. Among those without hair loss, 82.9% had Normocytic Normochromic Blood Picture, 14.3% had Microcytic Hypochromic Anemia and 2.9% had Normocytic Hypochromic Anemia. There was no significant difference in peripheral smear findings between those with and without hair loss.

Discussion

In our study, mean hemoglobin level is lower in hair loss patients (11.96 ± 1.79g/dL) compared to those

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without hair loss (12.59 ± 1.82µg/L). However, this difference is not statistically significant (P=0.096) which may be because of higher prevalence of anemia of various aetiologies in our country.

This was in close approximation with a study conducted by Kantor *et al.* [5] which showed no significant difference in mean hemoglobin levels among patients with telogen effluvium, androgenic alopecia, alopecia totalis and alopecia universalis when compared to those without hair loss.

In our study 60% of subjects with hair loss had normal hemoglobin and 40% had lower hemoglobin levels. Hair fall patients with normal hemoglobin in our study may be having other underlying causes of hair fall other than lower hemoglobin levels like stress, use of hair cosmetics/ hair dye, weight loss, other nutritional deficiencies, change in weather due to migration, undiagnosed endocrine abnormalities or even early stage of iron deficiency where hemoglobin levels remains unchanged etc.

In our study among those with hair loss (65/100) mean serum Ferritin was 43.22 ± 43.62 and among those without hair loss (35/100) was 69.30 ± 69.53 µg/L. There was a statistically significant difference in mean serum Ferritin between two groups (P=0.023).

In a study by Sarkar P *et al.* [9] mean serum ferritin levels among those with and without hair loss was 32.6ng/ml and 39.2ng/ml respectively which islower than the mean serum ferritin levels which we found in our study. But still there is significant difference between mean serum ferritin levels among cases and controls in their study similar to ours.

Similar observation was noted in a study by Chisti *et al.* [10] which also reported a significant difference (P=0.005) in the mean serum ferritin levels among participants with and without hair loss. Kantor *et al.* [5] found that in patients with hair loss and who were less than 40 years of age, mean serum ferritin concentrations were significantly lower than in controls.

As per the literature, serum ferritin cut-off value of 41µg/L yields specificity of 98% and sensitivity of 98%. Hence, our participants were also analyzed for the same. In our study majority of the subjects with hair loss (61.53%) had iron deficiency (ID) as defined by serum ferritin ≤ 40 µg/L and only few of subjects with hair loss (38.46%) had normal serum ferritin. Since study was conducted in a government hospital where majority of the participants were belonging to lower socioeconomic status, we have observed higher number of iron deficiency status in our study.

In a study by Olsen *et al.* [11] when serum ferritin level less than or equal to 40 µg/L was used as the definition, iron deficiency was seen in 63.8% of CTE patients.

Similarly, 72% of hair fall patients studied by Rushton *et al.* [12] and 76% of hair fall patients in the study conducted by Jayashankar *et al.* [1] were having iron deficiency with serum ferritin lower than that required for normal growth of the hair (≤ 40 µg/L). All these studies have shown significant association between hair loss and low serum ferritin which are similar to our studies.

The depletion of iron as reflected in the form of low serum ferritin levels in hair fall patients leads to lack of functioning of enzymes involved in proliferation of hair growth stem cells resulting in inhibition of hair growth.

In our study among those subjects with hair loss more number of patients showed lower serum ferritin levels compared to lower hemoglobin levels. Few subjects (16 out of 65 hair loss patients) in spite of having normal hemoglobin levels, had lower serum ferritin levels.

This is because of the well-known fact that, decreased hemoglobin level is seen in severe iron deficiency anaemia and not in the initial stages of iron deficiency unlike serum ferritin levels which is the earliest to get affected when there is decrease in the body iron stores.

So, serum ferritin levels as observed here is a better indicator of iron store in the body and hence acts as a better marker than hemoglobin in patients presenting with hair loss.

Conclusion

- There is statistically significant difference in the mean serum ferritin levels among those with and without hair loss. Majority of the hair loss subjects had lower serum ferritin levels.
- Even though hair loss is associated with decreased iron stores it is better to estimate serum ferritin level rather than haemoglobin to reflect the same. Therefore, serum ferritin levels need to be preferred over hemoglobin as better marker while dealing with patients of hair loss.

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