



ASSOCIATION BETWEEN SERUM FERRITIN LEVELS AND ALOPECIA IN FEMALE

Dr. Sanjay Sakarwal¹, Dr. Amit Kumar Kamboj²

¹ Associate Professor, Dermatology Venereology & Leprosy (Skin & VD, National Institute of Medical Science & Research, Jaipur Rajasthan

² Associate Professor, Department of Community Medicine, National Institute of Medical Science & Research, Jaipur Rajasthan

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Corresponding author: Dr. Amit Kumar Kamboj

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ABSTRACT:

Introduction: Diffuse hair loss in women is a very prevalent and difficult condition for dermatologists. Numerous research have looked at the connection between body iron status and various types of hair loss, with largely inconsistent results.

Aim: To evaluate whether chronic hair loss (CTE) in females are associated with decreased iron stores as measured by serum ferritin levels.

Material and methods: In our study, 70 females with CTE and a pattern of hair loss, ranging in age from 15 to 45, were included as a sample. A thorough medical history was obtained, followed by a systemic and dermatological examination. Clinical examination and a hair-pull test were used to diagnose CTE and Female pattern hair loss (FPHL). The Ludwig patterns I–III scale was used to rate the FPHL. Participants in the study had their serum ferritin levels checked as well.

Results: The hair-pull test yielded positive results for all participants with CTE but negative results for all women with FPHL. When the severity of hair loss in FPHL was assessed using Ludwig's scale, it was discovered that 32% (n=30) of participants had Grade III hair loss and 72% (n=40) of patients had Grade II hair loss.

The mean ferritin level for the entire study population was 20.3 g/l. Women with FPHL exhibited mean serum ferritin levels of 33.2 g/l compared to 16.1 g/l for women with CTE. The difference in the values, however, was found to be statistically significant (p 0.05).

Conclusion: We showed that among the study's participants, there is a correlation between ID and hair loss. In order to postulate a quantitative correlation between various etiological factors and hair loss in iron-deficient females, additional scientific research with a bigger sample size are necessary.

Key words: Alopecia, serum ferritin levels, chronic widespread hair loss, and female pattern baldness

Introduction

Diffuse hair loss in women is a very prevalent and difficult condition for dermatologists.¹ There are many causes for the illness. The most frequent cause is telogen effluvium (TE), which is followed by female pattern hair loss (FPHL) and chronic telogen effluvium (CTE). The other reasons are less frequent and are very simple to diagnose by history and examination.

The majority of diffuse alopecia cases are caused by TE, chronic TE (CTE), female pattern

hair loss (FPHL), and TE.² While slow widespread hair loss with thinning of the center scalp/widening of the central parting line/frontotemporal regression implies FPHL, abrupt, quick, generalized shedding of normal club hairs 2-3 months after a triggering event shows TE. The characteristic of CTE is excessive, frightening widespread shedding that occurs without a clear explanation from a head that appears normal and has plenty of hair.³ TE,

or hair shedding, is the result of the simultaneous transition of hair follicles from the anagen, or growing, stage to the telogen, or resting, stage. The condition known as acute TE or classical TE is self-limiting and lasts for three to six months; however, if the stimulus or event that produces diffuse shedding continues for longer than six months, the disease is known as chronic TE. CTE is defined as chronic diffuse loss that lasts more than six months and can either be primary or due to an underlying condition.

Chronic hair loss in women is frequently brought on by thyroid issues, diabetes, polycystic ovarian syndrome, anemia, and hypoproteinemia. Stress, medicines, pregnancy, cancer, chemotherapy, and other factors are also causes. The illness may typically be diagnosed clinically and treated medically.³ Premenopausal women's menstrual blood loss and pregnancy are the two main causes of iron insufficiency (ID).⁴ According to a review of the literature, 72% of women who have diffuse hair loss have an ID.⁵

Low iron storage have been speculated as a potential cause. According to observational evidence, women's alopecia may be related to lower body iron storage. As a result, it is typically advised to measure serum ferritin levels as part of normal research, and dermatologists frequently advise women to take iron supplements since they believe that low iron storage may contribute to hair loss. The importance of iron storage as determined by serum ferritin levels in women with hair loss has just lately been extensively explored.⁶

Numerous research have looked at the connection between body iron status and various types of hair loss, with largely inconsistent results. As a result, the purpose of the current study was to determine if chronic hair loss (CTE) in females is related to diminished iron storage as determined by serum ferritin levels.

MATERIAL AND METHODS:

The current cross-sectional study was carried out at the National Institute of Medical Science & Research, Jaipur Rajasthan, India, at the

Department of Skin & V.D. 70 females were chosen as the sample size. In our study, all female patients with CTE and patterned hair loss between the ages of 15 and 45 were enrolled. Women who refused to participate in the trial, were receiving iron therapy, had gastrointestinal or scalp surgery, had trichotillomania, had hormonal irregularities, or were taking medicine for systemic diseases were all excluded from the study. The institutional ethical committee granted ethical clearance. Each participant gave their signed agreement after receiving full information.

Each participant in our study group underwent a comprehensive physical and clinical assessment. A thorough medical history was obtained, followed by a systemic and dermatological examination. Clinical examination and a hair-pull test were used to diagnose CTE and Female pattern hair loss (FPHL). The Ludwig patterns I–III scale was used to rate the FPHL. The following was the grade: Grade I: (Mild) The top and front of the scalp experience hair loss, which is more apparent when the hair is parted down the middle of the scalp; Grade II: (Moderate) Thinning, shedding, general volume loss, and a center part that widens over time; Grade III: (Severe) In this case, the hair is so thin that it has a hard time hiding the scalp, making it obvious to the unaided eye. Participants in the study had their serum ferritin levels checked as well.

RESULTS:

This study comprised 70 female patients with CTE (70 patients) and FPHL (20 patients). Age range for women in the study population was 15–45 years, with an average age of 38.21 years. The median age of CTE patients was 29.10 years, whereas the median age of FPHL patients was 42.21 years.

The hair-pull test yielded positive results for all participants with CTE but negative results for all women with FPHL. When the severity of hair loss in FPHL was assessed using Ludwig's scale, it was discovered that 32% (n=30) of participants had Grade III hair loss and 72% (n=40) of patients had Grade II hair loss.

The mean ferritin level for the entire study population was 20.3 g/l. Women with FPHL exhibited mean serum ferritin levels of 33.2 g/l

compared to 16.1 g/l for women with CTE. The difference in the values, however, was found to be statistically significant ($p < 0.05$).

Table 1: Mean Serum Levels in Study Population

MEAN SERUM FERRITIN LEVELS	CTE	FHPL
	16.1 μ g/l	33.2 μ g/l.
P VALUE	<0.05*	

The mean value of hemoglobin (10.31 ± 1.61 g/dl c.f. 11.41 ± 1.57 g/dl; $p=0.001$), hematocrit ($30.42 \pm 6.41\%$ c.f. $33.01 \pm 7.10\%$; $p=0.014$) and mean corpuscular hemoglobin (28.03 ± 4.51 pg c.f. 30.11 ± 4.81 pg; $p=0.003$) was found to be significantly lower than the control group in our study. But Mean corpuscular volume (82.21 ± 9.43 fl) and Meancorpuscular hemoglobin concentration (31.82 ± 1.80 g/dl) were not significantly lower than that of controls as shown in Table 2.

Table 2: Comparison of Red Blood Cell indices between Cases and Controls.

RBC indices	Cases Mean \pm S.D.	Controls Mean \pm S.D.	P value
Hb (g/dl)	10.31 ± 1.61	11.41 ± 1.57	0.001*
Hct (%)	30.42 ± 6.41	33.01 ± 7.10	0.014*
MCV (fl)	82.21 ± 9.43	84.11 ± 9.21	0.077
MCH (pg)	28.03 ± 4.51	30.11 ± 4.81	0.003*
MCHC (g/dl)	31.82 ± 1.80	31.52 ± 2.38	0.085

The mean serum ferritin in cases (20.61 ± 9.72 ng/ml) was found to be significantly lower than controls (24.11 ± 7.95 ng/ml) [$p=0.020$] as shown in Table 2. On further analysis of subgroups of alopecia, the mean serum ferritin in alopecia areata (19.10 ± 9.73 ng/ml) and androgenetic alopecia (19.32 ± 10.12 ng/ml) was significantly lower than that in controls ($p=0.008$ and $p=0.021$ respectively). Although the mean serum ferritin of patients with telogen effluvium (23.71 ± 8.80 ng/dl) was lower than that of controls (24.11 ± 7.95 ng/ml), but there was not statistically significant difference ($p=0.851$) as shown in Table 3.

Table 3: Comparison of mean serum ferritin of various subgroups of alopecia and controls.

Study group	Number	Mean \pm S.D.(ng/ml)	p value
Alopecia areata	27	19.10 ± 9.73	0.008*
Androgenetal alopecia	21	19.32 ± 10.12	0.021*
Telogen effluvium	22	23.71 ± 8.80	0.851
Total cases	70	20.61 ± 9.72	0.020*
Controls	70	24.11 ± 7.95	

Discussion:

With a prevalence of 12-16% in adolescent girls and women of reproductive age (16-49 years of age) and 6-9% in women 50 years of age and beyond in the USA, iron deficiency is the most prevalent dietary deficit.⁷ In this study, we

looked at the correlation between serum ferritin levels and hair loss activities.

Our study's mean serum ferritin levels were 19.4 g/l, which is low when compared to Bregy and Trueb's investigations, which revealed mean serum ferritin levels of 53.14 g/L.⁸ Kantor et al.⁹ discovered that the mean serum ferritin

concentrations in the androgenetic alopecia (or FPHL) and TE groups were 37.3 and 50.1 g/l, respectively, compared to 59.5 g/l in controls. The mean blood ferritin concentrations in patients with FPHL or TE under the age of 40 were 15.0 and 23.8 g/l, respectively, compared to 62.3 g/l in controls.

In our study, the average blood ferritin level for CTE patients was 15.4 g/l. In comparison to our investigation, mean serum ferritin levels were found to be greater in studies by Bregy and Trueb (40.09 g/L) and Olsen *et al.* (51.81 g/L) that focused on CTE. 8,10

Our findings are consistent with earlier studies showing a link between low iron reserves as measured by serum ferritin concentrations and female hair loss.^{9,11,12} However, other studies^{10,13} found no conclusive evidence linking an iron shortage to hair loss.

Despite variations in laboratory measurements of serum ferritin concentrations of 10-15 g/L, it has been found that a cutoff of 41 g/L produces a 98% sensitivity and 98% specificity. Serum ferritin concentrations over 70 g/L are regarded as normal. Therefore, our study likewise employed the same criterion.

The Kantor *et al.* In otherwise healthy women with FPHL, TE, or a combination of the two conditions, the findings provided here reveal no association between hair loss activity and serum ferritin levels of 1–10 g/l.⁹ Therefore, whether therapeutic iron supplementation in these women is beneficial is still up for debate. Since we discovered that the majority (61.9%) of women with hair loss owing to FPHL, TE, or a combination of the two have serum ferritin levels above the cutoff limit with 92% sensitivity, Bregy A *et al.*⁸ came to the conclusion that the importance of tissue iron status in female hair loss has probably been exaggerated. Aydingoz *et al.*¹⁵ found no significant difference in the prevalence of depleted iron stores found in total subjects with diffuse or female pattern alopecia versus controls (32.5 vs. 45.6%), and Sinclair *et al.*¹⁴ found that only 12/194 (6.2%) of women with alopecia had serum ferritin levels 20 g/l.

Conclusion:

As a result, we show that among the study's participants, hair loss and ID are associated. In order to postulate a quantitative correlation between various etiological factors and hair loss in iron-deficient females, additional scientific research with a bigger sample size are necessary.

References:

1. Mounsey AL, Reed SW: Diagnosing and treating hair loss. *Am Fam Physician* 2009;80: 356–362.
2. Otberg N, Shapiro J. Hair growth disorders. In: Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Lefeell DJ, Wolff K, editors. *Fitzpatrick's Dermatology in General Medicine*. 8th ed. New York, USA: McGraw-Hill; 2012. p. 979-1008.
3. Shrivastava SB. Diffuse hair loss in an adult female: Approach to diagnosis and management. *Indian J Dermatol Venereol Leprol* 2009;75:20-7
4. Trost LB, Bergfeld WF, Calogeras E. The diagnosis and treatment of iron deficiency and its potential relationship to hair loss. *J Am Acad Dermatol* 2006;54:824-44.
5. Rushton DH, Ramsay ID, James KC, Norris MJ, Gilkes JJ. Biochemical and trichological characterization of diffuse alopecia in women. *Br J Dermatol* 1990;123:187-97
6. Trost LB, Bergfeld WF, Calogeras E: The diagnosis and treatment of iron deficiency and its potential relationship to hair loss. *J Am Acad Dermatol* 2006;54:824–844.
7. Centers for Disease Control (CDC): Iron deficiency – United States, 1999–2000. *Morb Mortal Wkly Rep* 2002;51:897–899.
8. Bregy A, Trueb RM. No association between serum ferritin levels >10 microg/l and hair loss activity in women. *Dermatology* 2008
9. Kantor J, Kessler LJ, Brooks DG, Cotsarelis G: Decreased serum ferritin is associated with alopecia in women. *J Invest Dermatol* 2003;121:985–988.
10. Olsen EA, Reed KB, Cacchio PB, Caudill L. Iron deficiency in female pattern hair loss, chronic telogen effluvium, and control groups. *J Am Acad Dermatol* 2010;63:991-9.
11. Moeinvaziri M, Mansoori P, Holakooe K,

- Safae Naraghi Z, Abbasi A: Iron status in diffuse telogen hair loss among women. *Acta Dermatovenerol Croat* 2009;17:279–284.
12. Deloche C, Bastien P, Chadoutaud S, Galan P, Bertrais S, Hercberg S, de Lacharrière O: Low iron stores: a risk factor for excessive hair loss in non-menopausal women. *Eur J Dermatol* 2007;17:507–512.
 13. Rushton DH, Ramsay ID: The importance of adequate serum ferritin levels during oral cyproterone acetate and ethinyl oestradiol treatment of diffuse androgen- dependent alopecia in women. *Clin Endocrinol (Oxf)* 1992;36: 421–427.
 14. Sinclair R: There is no clear association between low serum ferritin and chronic diffuse telogen hair loss. *Br J Dermatol* 2002;147: 982–984.
 15. Aydingoz I, Ferhanoglu B, Guney O: Does tissue iron status have a role in female alopecia? *J Eur Acad Dermatol Venereol* 1999;13: 65–67. 8.