



Original Research Article

Hair loss from scalp among women: Does serum levels of iron, cobalamin and folic acid matter?

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ABSTRACT

Introduction: Hair fall from the scalp is a common complaint by females attending a dermatologist's outpatient clinic. The most common cause is telogen effluvium and the most common pattern is chronic diffuse non-scarring hair fall from the scalp.

Objectives: The aim of our study was to analyze deficiency status and correlate hemoglobin, ferritin, cobalamin, folic acid in females of reproductive age group.

Materials and Methods: This is a descriptive study was conducted in the DVL department of a tertiary care medical college hospital between 2018-2019. Clinical and demographic data were collected and hemoglobin, ferritin, cobalamin, folic acid levels were investigated.

Results: A total of 85 patients were studied. Mean Hemoglobin was found at 11.92 g/dl and Anemia was recorded at 59.32%. Ferritin levels were lower than normal in 90% of the cases. Folate levels were in the normal range in the majority of our cases. Cobalamin was deficient in 50% of our patients.

Conclusion: Ferritin and cobalamin levels were better indicators than hemoglobin levels alone in assessing chronic nonscarring hair loss from the scalp in females of reproductive age group.

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1. Introduction

Diffuse hair loss from the scalp is a common complaint encountered by physicians at their clinics amongst both genders more so in women.¹ Female of the age group 20-45 years represent the major cohort of consultations.² Alopecia can lead to shyness, decreased social acceptability among peers, low self-confidence among these patients.³

Alopecia is mostly acquired or inherited. Inherited forms being relatively rare result either from anomalous hair shaft or dysgenesis/agenesis of the hair follicle which could be focal or usually diffuse. These affect the younger age group and tend to improve with age. The acquired forms affect the older age group, are common and classified as

diffuse, patterned, and focal. Each of them could be further sub-classified as scarring or cicatricial and nonscarring or noncicatricial.⁴ The Diffuse hair fall seen is usually without a pattern, non-scarring and non-inflammatory. Telogen effluvium is a disruption of one of the phases of the hair growth cycle and is the most common cause after female pattern hair loss and alopecia areata for diffuse hair fall.⁵ Diffuse hair fall could be provoked by chronic illnesses, chronic thyroid disorders, chronic nutritional deficiencies, chronic anemias, chronic hepatic and renal disorders.⁵

The myths and misconceptions around hair loss abound. Good nutrition giving good hair is accepted folklore. Nutritional inadequacies are still a prevalent problem in our country.⁶ The over-the-counter (OTC) medications, a habit of self-medication, seem to escalate the issue in ill-informed

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patients.³

The role of trace elements, minerals, proteins, vitamins in hair replication is enormous of which our understanding is meager.⁷ Iron deficiency is considered the most common trace element deficiency. Though diverse studies for correlations between iron impairment and hair loss exist, associations are still not clear. The role of iron as a cofactor for ribonucleotide reductase, the rate-limiting enzyme for DNA synthesis.⁸ Hemoglobin, which is used to screen for nutritional deficiency, can be used as the patient's functional nutritional status indicator.⁹ Ferritin is a sought-after molecule to know about the general status of iron stores in our body.¹⁰

Cobalamin is used as a coenzyme for enzymatic reactions of hematopoiesis and fatty acid. Folic acid is utilized as a coenzyme in many one-carbon transfer reactions.¹¹ Role of Cobalamin and folic acid in hair biology is seen as an enigma however, their supplementation brings normalization of hair growth. More common than not, even after comprehensive investigations, the cause and diagnosis of diffuse hair fall become a daunting issue. The dearth of studies on the causal association of diffuse scalp hair loss and nutritional status justify an investigation.¹²

We conducted this study to determine the levels of hemoglobin, serum ferritin, serum cobalamin (B12), serum folic acid (B9) and their correlations in chronic non-scarring diffuse hair fall of the scalp in reproductive age group females to assess their role in hair growth cycle at a tertiary care referral medical hospital in Bangalore.

2. Objectives

To determine the levels of hemoglobin, serum ferritin, serum cobalamin, serum folic acid and their correlations in chronic non-scarring diffuse hair fall of the scalp in reproductive age group females.

3. Materials and Methods

A descriptive study was conducted at the Dermatology Venereology and Leprosy Out-patient department of a tertiary care institution at Rajajinagar, Bangalore during the period February 2018 to December 2019. All those patients with chronic hair loss were performed a detailed systemic and muco-cutaneous examination. Patients with hair loss from the scalp of more than 6 months duration, females with regular menstrual cycles at the time of study were included in the study. But patients with any signs and symptoms of systemic inflammatory diseases like connective tissue diseases/tuberculosis/leprosy, chronic kidney diseases, hyper/ hypothyroidism, polycystic ovarian disease, alopecia areata, female pattern hair loss, scarring alopecias, menopausal women, hair loss of fewer than six months duration were excluded from the study. Hair pull test was conducted as an adjuvant in most cases.

After applying inclusion and exclusion criteria eighty-five subjects of chronic hair fall were then included in the study as cases and data collected in pre-structured questionnaire.

After obtaining clearance from the institutional ethics committee and informed consent, 5ml of venous blood was collected. Hemoglobin, serum ferritin, vitamin B12, folic acid levels were estimated using Chemiluminescence Immunoassay in an automated Beckman Coulter Access 2 Analyzer and Sysmex Ki 21X.¹³

The normal range is: Serum Ferritin (11-307 ng/ml), Hemoglobin (12.5-16.5 g/dl), Serum B12 (180-914 pg/ml), Serum B9 (2-20ng/ml).

3.1. Statistical analysis

All the data collected in the pre-structured questionnaire were entered on MS Excel and was analyzed using STATA 17.0 BE (Texas, USA). Data was analyzed for frequencies, mean, correlations, and standard deviation. The data was also presented as Scatter graphs with trend lines for effective visualizations.

4. Results

Total of 85 females in the reproductive age group were included in the study.

Table 1: Stratification of age among the study population (n=85)

Age (years)	Frequency	Percentage
15-25	22	25.88
26-35	24	28.24
36-45	34	40.00
46-50	5	5.88
Total	85	100

The mean age was found to be 33.30 ± 9.075 years. The majority, 40% (34) of participants belonged to the 36-45 years age group. The mean duration of hair fall was 32.52 ± 40.79 months.

The fifty-nine cases, who got their hemoglobin tested had mean hemoglobin of 11.92 ± 1.66 g/dl. The range of hemoglobin was found to be 7.5-14.4g/dl. Anemia was recorded in 59.32% (35) and normal in 40.67% (24).

The mean Ferritin was 32.67 ± 68.17 ng/ml. Out of 85, only 41 got their ferritin levels done. Following the Zhang et al¹⁴ criteria only 9.75% (4) were having sufficient ferritin for regular hair growth. The majority, 48.78% (20) had frank iron deficiency with 21.95% (9) in the iron-depleted range and 19.51% (8) in ferritin insufficiency limits. Overall, 90.24% (37) had ferritin inadequate for their hair growth cycle.

We found that there was 24.22% correlation between hemoglobin and ferritin. However, we had not included 44 cases for which serum ferritin values were not available.

The Vitamin B12 levels were normal in 47.91% (23), deficient in 50% (24), and increased in 2.08% (1). There

Table 2: Stratification of Ferritin levels among study subjects

Serum ferritin levels (Zhang et al criteria ¹⁴)	Frequency	Percentage
Sufficient ferritin for regular hair cycle >71ng/ml	4	4.71
Insufficient ferritin for regular hair cycle >21 - <70 ng/ml	9	10.59
Iron depletion >13-<20 ng/ml	8	9.41
Iron deficiency < 12 ng/ml	20	23.53
Not evaluated	44	51.76
Total	85	100

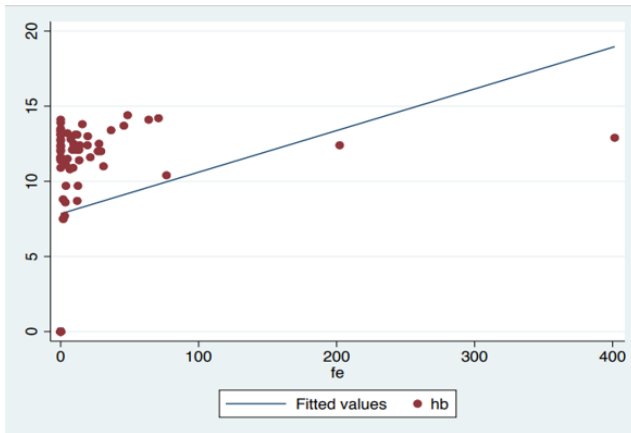


Fig. 1: Graph showing correlation between Ferritin and Hemoglobin

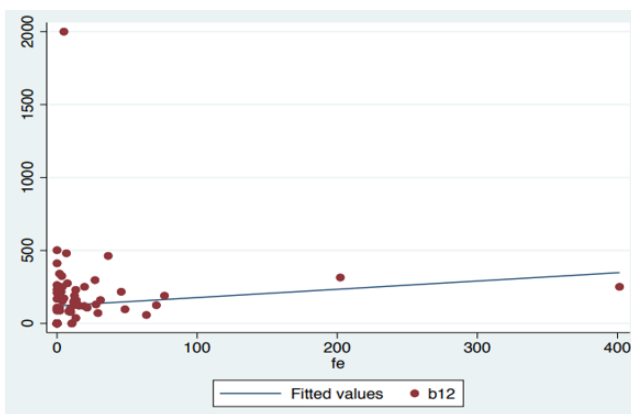


Fig. 2: Graph showing correlation between Ferritin and Cobalamin

was an 11.71% correlation between ferritin and cobalamin. However, we have not included 37 cases of patients whose data were not available for cobalamin.

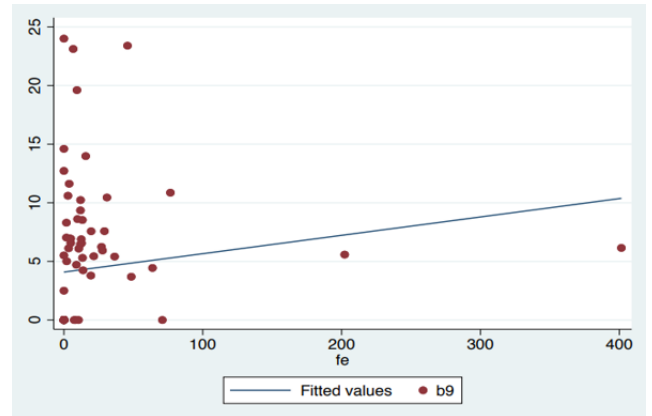


Fig. 3: Graph showing correlation between Ferritin and Folate

The Vitamin B 9 levels was normal in 92.85% (39), deficient in none and increased in 7.14%.³ The correlation between ferritin and folate was found to be 13.55%. However, we have not included 43 cases of patients whose data were not available for folate.

5. Discussion

Chronic diffuse non-scarring hair fall is a common complaint among females of the reproductive age group, the most common cause being telogen effluvium.¹⁰ In our study, mean age of cases was 33.30±9.075 years concordant with studies by Amatya B¹⁵ (30.22±11.35), Poonia K et al¹ (30.1 ±9.4), Deo K et al² (30.96±8.48) overlapping with those of studies by Surit M¹⁶(28.9±8.0), Gowda D¹² (29.19±6.11), Malkud S⁵(26.74), Fatani MI et al¹⁷ (29.82±11.34) and Ozturk P et al¹⁸ (26.06±8.74).

The age range was 15-50 years in our study, while Amatya B¹⁵ have had (9-65 years), Surit M¹⁶ (18-45 years), Poonia K et al.¹ (14-63 years), Gowda D¹² (18-40 years), Deo K et al²(15-60 years), Malkud S⁵(15-45 years) and Fatani MI et al¹⁷(10-62 years).

The majority in our study, forty percent of cases had hair fall in 36-45 years age group similar to Poonia K et al¹ of 62% (21-40 years), Deo K et al² 34% (31-50 years) however results of studies by Amatya B¹⁵ 68% (16-35 years), Surit M¹⁶ 61% (18-30 years), Malkud S⁵ 53% (31-50 years) and Fatani MI et al¹⁷ 37.55% (31-50) showed lesser age group.

The mean duration of hair fall was 32.52±40.79 months while Malkud S⁵ quoted 6 months to 8 years.

In our study anemia was recorded in 59.32% similar to studies by Poonia K et al¹ who have found 67% and Malkud S⁵ 50%. The study by Amatya B¹⁵ which comprised both acute and chronic telogen effluvioms quote 28.6%. Fatani MI et al,¹⁷ whose study comprises all causes of telogen

effluviums (chronic telogen effluvium:79%) cites 94%. They have a two-point elevated lower limit of hemoglobin range. Hemoglobin being on the lower percentile of normal (11.92 g/dl) in our study emphasizes the role of iron in hair follicle matrix cells which are robust and metabolically active as a first salvage site for minor iron depletion and during a crisis.¹⁹

Using categorization by Zhang et al,¹⁴ 90.25% of our cases would be insufficient to utilize ferritin for regular hair cycle concordant with studies by Malkud S⁵ who has quoted 88% deficiency, Fatani MI et al¹⁷80%, Olsen EA 75%,²⁰ Rushton 95%²¹ all of whom have taken <70ng/ml as ferritin deficiency status. Surit M¹⁶ have found a deficiency of ferritin (<50ng/ml) in their chronic telogen cases significantly. Poonia K et al¹ has quoted a 70% ferritin deficiency(<30ng/ml) in their study. Ozturk P et al¹⁸ found no ferritin deficiency status in their study. Various authors in different geographic areas have taken different cutoff ranges for deficiency levels of ferritin from 10-70 ng/ml. So, hair fall happening but with contradictory lab results is a possibility.²² There was a 24.22% correlation between hemoglobin and ferritin in our study.

Cobalamin (B12) was deficient in 50% (24) of cases who got it done. One (2.08%) of the patient had it in excess who had the habit of OTC usage. Study Poonia K et al¹ by found 79% deficiency. Gowda D¹² have quoted 9.26% deficiency whose cases are formidably composed of females with chronic hair loss (77.77%). The same study has quoted 79.63% deficiency for folic acid but none of the cases had folate deficiency in our study. In fact, excess levels were seen in 7.14% (3) of our study. A study by Ozturk P et al¹⁸ found no deficiency of either cobalamin or folate levels and their population are predominantly non-vegetarians. Rushton²³ too in their study found a 2% deficiency status of cobalamin who consume a nonvegetarian diet. There was a positive correlation between ferritin with cobalamin (11.71) and with folate (13.55) in our study.

6. Conclusion

Chronic hair loss and nutritional status have been associated since time immemorial. However, the levels of hemoglobin will give an estimate of the general nutritional status of the individual, but ferritin, cobalamin, and folic acid levels indicate the status of specific trace elements. Estimation of ferritin, cobalamin, and folic acid levels could help the patients with chronic hair loss, whenever there is a deficiency, which can be easily supplemented.

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8. Conflict of Interest

The authors declare they have no conflict of interest.

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