

THE RELATIONSHIP OF SERUM FERRITIN LEVELS, IN FEMALE PATIENTS WITH TELOGEN EFFLUVIUM: A CASE CONTROL STUDY

Irfan Ullah¹, Mohammad Majid Paracha², Zahidullah Khan¹, Amjad Shahzad¹, Hina Zahoor³, Mehran Khan¹, Rabeeka Bakhtiar³

¹Department of Dermatology, Khyber Teaching Hospital, Peshawar - Pakistan

²Department of Dermatology, Lady Reading Hospital, Peshawar - Pakistan

³Department of Dermatology, Hayatabad Medical Complex, Peshawar - Pakistan

ABSTRACT

Objective: To determine the relationship of serum ferritin level with telogen effluvium (TE) in female patients.

Material and Methods: This case control study was conducted at Dermatology unit, Khyber Teaching Hospital, Peshawar-Pakistan, from June 2017 to May 2018. A total of 100 female individuals who visited outpatient department (OPD) were included in the study. They were divided in two groups, 50 were patients and 50 were healthy individuals. After taking informed consent and fulfilling the inclusion criteria, individuals were enrolled in study and serum ferritin level was checked once at first visit.

Results: One hundred female individuals were studied. They were divided in two equal groups, 50 were in patients group (cases) and 50 were healthy individuals (controls). The mean age was 26.26 ± 7.61 years in patients group while 31.88 ± 6.62 years in healthy controls. The mean serum ferritin level was 47.54 ± 19.85 ng/ml among patients with telogen effluvium as in comparison to 72.13 ± 5.40 ng/ml in healthy controls which shows statistically remarkable difference among the two groups ($p=0.00$). Mean hemoglobin level was 10.53 g/dl among patient group while 12.55 g/dl in healthy individuals. Again statistically result was very significant with ($p=0.0001$). MCV in patient group was 47.36 ± 10.67 and healthy control was 83.38 ± 5.80 .

Conclusion: This study clearly highlights that low serum ferritin level is associated with telogen effluvium.

Key Words: Telogen effluvium, Serum, Ferritin, Female pattern hair loss.

This article may be cited as: Ullah I, Paracha MM, Khan ZU, Shahzad A, Zahoor H, Khan M, Bakhtiar R. The relationship of serum ferritin levels, in female patients with Telogen Effluvium: A case control study. J Med Sci 2019; 27: (2) 116-119

INTRODUCTION

There are three stages of scalp hair growth i.e. anagen (active hair growth phase), telogen (resting phase) and catagen (regression phase), with roughly 86% hairs being in an active hair growth phase, 1% in regression, and 13% in resting phase¹. Hair loss increases about 70% in telogen effluvium and daily hair shedding up to 300 hairs². Pattern of hair loss in female and telogen effluvium account for majority of diffuse hair

loss.³ Telogen effluvium is defined as a disorder of the hair of scalp characterized by shedding or thinning of scalp hair due to early entry of hair in resting phase of hair follicle called Telogen phase⁴. Telogen effluvium results from various causes including psychological, telogen gravidarum, febrile illness, any surgery, drugs like synthetic vitamin A derivative, blood loss and dietary deficiencies⁵. Iron deficiency as a cause of telogen effluvium is established by various other studies⁶. Serum ferritin concentration is a measurement of stored iron, iron transported by transferrin and iron bound to hemoglobin, and hematocrit^{6,7}.

Hair synthesis implicates iron in many ways within the hair follicle, indicating that Iron deficiency may interrupt hair synthesis⁸. It is described that iron-

Dr. Mohammad Majid Paracha (Corresponding Author)
Department of Dermatology, Lady Reading Hospital,
Peshawar - Pakistan

E-mail: mohammadmajidparacha@gmail.com

Contact: +92 - 333-9637010

Date Received: 17 January, 2019

Date Revised: 24 April, 2019

Date Accepted: 20 May, 2019

dependent genes in the dermal papillae of hair follicle could be affected by Iron Deficiency⁹. Iron deficiency anemia is diagnosed by its definite indicator which is low serum ferritin level. In Korean women, the prevalence of diffuse hair loss at all ages was 5.6%¹⁰. In the UK, 6% of women aged <50 years were diagnosed as having female pattern hair loss (FPHL). No data is available in subcontinent. Although figures are not reliable but estimated life-time prevalence was 1.7%¹¹.

Iron deficiency is present in 72% of women with diffuse hair loss¹². Controversy exists regarding the association of telogen effluvium and iron deficiency, so the purpose of this study is to further strengthen the concept that the women who are more prone to have excessive hair loss has low levels of iron that is Iron deficiency in comparison to control women.

Body iron status is associated with different types of hair loss. Therefore, this study will show whether telogen effluvium is associated with decreased iron stores as measured by serum ferritin levels. These findings will help us in understanding the triggers for hair loss and therapeutics. Moreover this study is first of its type to be conducted in Khyber Pakhtoonkhwa.

MATERIAL AND METHODS

This Case control study was conducted in the Dermatology unit, Khyber Teaching Hospital Peshawar from June 2017 to May 2018. Total sample size calculated was 71, using anticipated probability of exposure given disease as 0.70 and anticipated probability of exposure given no disease as 0.50, relative precision as 0.5 and a confidence interval of 95% and anticipated odds ratio of 2.33 using WHO software for sample determination. A sample size of 100 was used comprising two equal groups, 50 cases and 50 controls. Non-Probability consecutive sampling technique was used for sample collection.

All the female individuals between 15–45 years of age, with chronic diffuse hair loss, diffuse thinning of hair was included in study. Female patients on Iron therapy, gastrointestinal problems, scalp surgery, Trichotillomania, Hormonal abnormalities, chronic illness associated with telogen effluvium and androgenetic type of hair loss were excluded from study.

The control group included individuals who were healthy with no chronic dermatological and medical illness. Informed written consent was taken from all individuals who were included in study. Detailed history

with physical and clinical examination, and relevant investigation were performed in our hospital laboratory by a qualified pathologist. Telogen effluvium's diagnosis was made on clinical grounds and by Hair Pull test. Pre-designed proforma was used for data collection. Serum ferritin levels of the study participants were measured by standardized method in Khyber Teaching Hospital laboratory. Serum ferritin levels were divided in 3 groups, very low, low and normal.

Analysis of result was made Using SPSS version 20. For continuous variables like age Mean $\pm$ standard deviation was calculated. Frequencies and percentages were calculated for categorical variables like gender. Post stratification chi square test, in which p value lesser than 0.05 was considered as significant, were applied. Pearson's correlation coefficient was calculated, and one sample t test was used wherever applicable. The results were expressed as percentage and significance.

About 20–60 hairs are pulled between the fingers from the hair roots firmly, tugged away from the scalp. If 10% or more hairs are plucked from the scalp, the test will be considered as positive, and implies active hair loss. The concept behind the hair pull test is to confirm that the hairs are in telogen phase 9. Serum ferritin estimation was done using ADVIA Centaur System Ferritin assay (Normal range: >70ng/ml).

RESULTS

The control sample included 50 patients with age between 20 to 44 years and patient group age range from 15 to 45 years. Serum ferritin concentration and hemoglobin level were tested at least once in all participants. The mean age was 26 ± 7.61 years in patients and 31.88 ± 6.62 years in healthy controls. The mean serum ferritin level was 47.54 ± 19.85 ng/ml among patient group in comparison to 72.13 ± 5.40 ng/ml for

Table 1: Variables of current study Group Statistics

	Group	N	Mean	Std. Deviation
Ferritin	control	50	72.1356	5.40195
	patients	50	47.5430	19.85060
Hb	control	50	12.5520	.86526
	patients	50	10.5372	1.00349
MCV	control	50	83.3860	5.80840
	patients	50	74.3574	10.67811
Socioeconomic	control	50	1.5600	.50143
	patients	50	1.8800	.32826

healthy control. Statistically difference was remarkable with ($p=0.00$). Mean hemoglobin level in patient group was 10.53 g/dl as compared to 12.55g/dl among control ones. Again the difference was of statistical significant with ($p=0.0001$). Patient MCV was 47.36 ± 10.67 in cases and 83.38 ± 5.80 in controls.

DISCUSSION

Telogen effluvium is well known by abnormality in hair cycling which results in hair fall those are in telogen phase¹³. It is the type of non-scarring and non-inflammatory hair loss with multiple associations¹⁴. This study was conducted on female individuals aged 15–45 years, which is consistent with Kantor et al, in which age range of patients was 18-71 years. In this study most patients suffering from Telogen effluvium were of 15-45 years of age, because hair loss is a greater concern for young age group.

The mean age of patients in this study was 26.26 ± 7.61 years, which is comparable with Karadag LM, in which mean age of patients was 29.1 ± 11.9 years^{8,9}. Mean serum ferritin levels were 47.54 ng/ml in patients with Telogen Effluvium, which is comparable with Fatani M, where mean serum ferritin level of 40.30 ng/ml and 72.13 ng/ml in healthy controls, which is again consistent with fatani M, where mean ferritin level of control was 5.57 ng/ml⁷.

The mean difference in serum ferritin level was statistically remarkable ($p=0.000$) between patients and controls according to an independent sample T test which is comparable with Wang TL¹⁰. Similar findings with statistically significant difference between patients and control group was also found in Ibrahim et al, and Sarkar SS^{16,17}.

This low ferritin level in patients with telogen effluvium may be due to its multifactorial etiology¹⁸. Medication, fever, rapid weight loss, and numerous other factors may cause telogen effluvium¹⁹. The mean hemoglobin level in our patient group was 10.53 g/dl, which is comparable with study conducted by Rasheed M⁸. However, the mean hemoglobin level in the control group was 12.55 g/dl which exhibited a statistically remarkable contrast of 2.02 g/dl from telogen effluvium patients ($p=0.000$). This may result because this finding could be because iron deficiency could not be judged only by hemoglobin level.

In patients with chronic inflammatory condition, infection, malignancy or end stage renal disease, the ferritin levels are unreliable. The accuracy in soluble

transferrin saturation, transferrin receptor or a transferrin receptor-ferritin index may be increased if used as additional testing²⁰. Multi-center and Case-control studies with large sample sizes are needed to establish the potential role of iron deficiency during the normal hair cycle. Study on iron supplementation to prove that iron has role in TE.

CONCLUSION

Low serum ferritin level is associated with Telogen effluvium and hence implicating that iron deficiency anemia is a potential cause of telogen effluvium, therefore necessitating further research in this regard.

REFERENCES

1. Olsen E. Androgenetic alopecia. In: Disorders of Hair Growth. New York: McGraw Hill, Inc; 1994: 257-83.
2. Shapiro J. Diseases of the hair. In: Raykel R, editor. Conn's Current Therapy. Philadelphia, PA: WB Saunders; 1996:739-41.
3. Otberg N, Shapiro J. Hair growth disorders. In: Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Lefell DJ, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 8th ed. New York, USA: McGraw Hill; 2012: 979-1008.
4. Harrison S, Sinclair R. Telogen effluvium. Clin Exp Dermatol 2002;27:389-9.
5. Bernstein GM, Crollick JS, Hassett JM. Post febrile telogen effluvium in critically ill patients. Crit Care Med 1988;16: 98-9.
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;54:824-44.
7. Fatani MI, Bin Mahfoz AM, Mahdi AH, Alafif KA, Hussain WA, Khan AS, et al. Prevalence and factors associated with telogen effluvium in adult females at Makkah region, Saudi Arabia: A retrospective study. J Derm D Saud. 2015;19(1):27–30.
8. Rasheed H, Mahgoub D, Hegazy R, Elkamy M, AbdelHay R, Hamid HA, et al. Serum ferritin and Vitamin D in female hair loss: Do they play a role. Skin pharmacol physiol 2013;26:101-7.
9. Karadag AS, Ertug Rul DT, Tural E, Akin KO. The role of anemia and Vitamin D level in acute telogen effluvium. Turk J Med Sci 2011;41(5):827-33.
10. Wang TL, Zhou C, Shen YW, Wang XY, Ding XL, Tian S, et al. Prevalence of androgenetic alopecia in China: A community-base study in six cities. Br J Dermatol 2010; 162:843-7.
11. Paik JH, Yoon JB, Sim WY, Kim BS, Kim NI. The prevalence and types of androgenetic alopecia in Korean

- men and women. Br J Dermatol 2001; 145:95- 9.
12. Birch MP, Messenger JF, Messenger AG. Hair density, hair diameter and the prevalence of female pattern hair loss. Br J Dermatol 2001; 144:297-304.
 13. Malkud S. Telogen effluvium: A review. J Clin Diagn Res 2015; 9(9): 01–03.
 14. Loh SH, Lew BL, Sim WY. Localized telogen effluvium following hair transplantation. Ann Dermatol. 2018;30(2):214–7.
 15. Kantor J, Kessler LJ, Brooks DG, Cotsarelis G. Decreased serum ferritin is associated with alopecia in women. J Invest Dermatol 2003; 121:985-8.
 16. Ibrahim MK, Abd-Elal EB, El Shahed AR, Maawad AN, El-Gendy AA, Elsaie ML. Estimation of Serum Ferritin Level in Female Patients with Telogen Effluvium. Hair Ther Transplant 2012;2:104- 9.
 17. Sarkar P, Raghunathan H, Harish MR, Shashikumar BM. A Case Control Study to Determine the Correlation between Serum Ferritin Levels and Chronic Telogen Effluvium in a Tertiary Hospital Mandya. Webmed Central Biochemistry 2013;4(2): WMC004033.
 18. Trueb RM. Telogen Effluvium. Is there a need for new classification? Skin Appendage Disord. 2016;2(1):39–44.
 19. Weyand AC, Shavit JA. Agent specific effects of anticoagulant induced alopecia. PractThrombHaemost. 2017;1(1):90–2.
 20. Suega K, Kandarini Y, TubungJ. Role of Soluble Transferrin Receptor and Transferrin Receptor-Ferritin Index to Detect Iron Deficiency Anemia in Regular Hemodialysis Patients. Maced J Med Sci. 2019; 7(1): 97–102.

CONFLICT OF INTEREST: Authors declare no conflict of interest
GRANT SUPPORT AND FINANCIAL DISCLOSURE NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

- | | |
|--------------------|---|
| Ullah I: | Preparation of research topic, data collection. |
| Paracha MM: | interpretation of data, overview the process. |
| Khan ZU: | Data collection. |
| Shahzad A: | Preparation of research topic, data collection. |
| Zahoor H: | Help in laboratory work and Preparation. |
| Khan M: | Preparation of research topic, data collection. |
| Bakhtiar R: | Help in laboratory work and Preparation. |

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.