Levels of Ferritin in Females with Chronic Telogen Effluvium: A Cross-Sectional Study in Western Nepal

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ABSTRACT

Introduction: Telogen effluvium is one of the common causes of hair fall in women. It can be divided into acute and chronic; acute telogen effluvium lasts for a duration of less than 6 months while chronic telogen effluvium lasts for more than 6 months. Total body iron store is necessary for the growth and maintenance of hair follicles and their cycle. There seems to be some relationship between telogen effluvium and serum ferritin levels as many studies in past and recent years have shown.

Materials and Methods: The study is an analytical observational type of study and belongs to quantitative cross sectional prospective study. A total of 39 patients and equal number of controls were recruited for carrying out this study. All the patients were selected from the outpatient department of Manipal Teaching Hospital, Pokhara, Nepal where as the controls were selected partly from the outpatient department and partly from volunteers. For the statistical analysis of the study SPSS (Statistical Package for the Social Sciences) version 23 was used.

Results: The mean level of serum ferritin in patients was 23.53±28.66ng/ml and in controls it was 90.91±93.73ng/ml. In order to find out the difference in significance we performed Independent t- test. After comparing the equality of means and variance, performing independent t- test, the p-value of <0.05 was observed, which meant that there was a significant difference between the serum ferritin levels of patients and controls.

Conclusion: There was a significant difference in the levels of serum ferritin when compared between telogen effluvium patients and controls. The findings of our study helped in consolidating our understanding of the diagnostic value of serum ferritin in cases of telogen effluvium.

Keywords: serum ferritin, chronic telogen effluvium, hair loss

INTRODUCTION

Telogen effluvium is one of the common causes of hair loss. It can be divided into acute and chronic; acute telogen effluvium lasts for duration of less than 6 months while chronic telogen effluvium lasts for more than 6 months. Telogen effluvium has various aetiological factors among which the common causes are iron deficiency anaemia, hypothyroidism, recent stressful events (such as surgery, high fever, pregnancy, anxiety), drugs (anticonvulsants, anticoagulants, retinoids). Among patients with iron

deficiency anaemia usually serum ferritin is below the reference range although decreased serum ferritin can occur without iron deficiency anaemia. Ferritin is a protein which was discovered in 1937 by the French scientist Laufberger.[1] After almost 35 years of the discovery, serum ferritin was reliably detected in facilitated laboratories.[2] A single ferritin molecule can sequester up to 4500 iron atoms and a single hepatocyte could accumulate over 160,000 iron molecules per minute.[3] Although there is a controversy for the cutoff point of ferritin levels, for practical purposes we consider it to be 40ng/ml, since the traditional cut off point of 10 to 20 ng/ml was too low to detect iron deficiency anaemia in general population.[4]Conditions related to decreased serum ferritin are iron deficiency anaemia, hypothyroidism, vitamin C deficiency.[5]

MATERIALS AND METHODS

This study is a quantitative cross sectional prospective study. It deals with the values of serum ferritin in all the recruited patients of telogen effluvium. The main objective of this study is to find out the correlation between serum ferritin level and chronic telogen effluvium in females. Permission for the conduct of the study from IRC (institutional review committee), approved by NHRC(Nepal health research counsil) was given on 6th July 2022. The study was conducted from 17th July 2022 till 17th January 2023, total duration of study being six months. For the study group we selected the patients clinically diagnosed as chronic telogen effluvium with the duration of hair loss more than six months. Patients who were on corrective therapies for anaemia (iron, folic acid, vitamin B12), were pregnant in the preceding one year, had undergone major surgery or were suffering from endocrine abnormalities and those under medication for systemic disorders were excluded from the study. When in doubt for diagnosis the help of dermoscopy was taken, which has a magnification of up to 250 times. On dermoscopy the classical features of telogen effluvium include absence of miniaturized hair, telogen hairs of more than 20% and hair diameter diversity of less than 20%.The closest differential diagnosis would be androgenetic alopecia.

Female patients with diagnosis of chronic telogen effluvium with the onset of hair loss being more than 6 months presenting to the Department of Dermatology, Manipal Teaching Hospital were recruited for the study. For this study, females of 18 years and above were selected. Informed written consent from the subjects to be enrolled was taken. Equal number of age and sex matched controls were also taken. The controls were selected from the dermatology outpatient department and volunteers who didn't have any hair issues, same exclusion criteria as with the cases were also applicable for the controls. Sample size for the study was calculated to be 39 considering the prevalence of telogen effluvium to be 2.6%[6].

RESULTS

The total number of cases and controls were 39 each. In cases, none of the patients were more than 60 years and the eldest patient was 45 years old, while in the control group 3 patients were above 60 years. Most of the patients as well as controls were in the range of 18 years to 40 years. More than 80% of the cases were less than 40 years, while around 70% controls were below 40 years. Rest of the age distribution of patients and controls are given in the bar diagram below(Fig 1). Mean age of the patients was 27±8.3 years while the mean age of the controls was 33.5±14.8 years(p=0.158)suggesting that any differences in ferritin levels between cases and controls were not due to age difference.

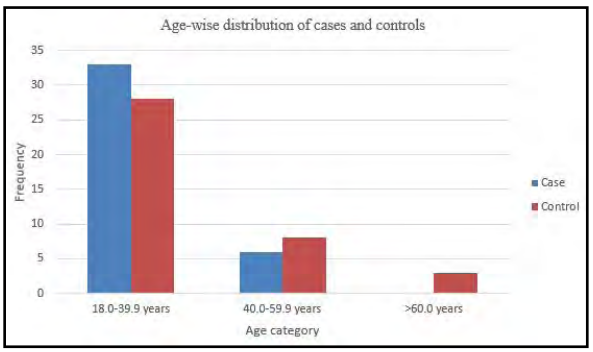

Figure 1. Age distribution of cases and controls

For telogen effluvium we usually consider levels of ferritin <40 nanogram/ml to be the cut off level for ferritin deficiency, although some consider it to be <20ng/ml. Therefore we have divided ferritin deficiency into three groups, mild, moderate and severe. Mild deficiency is serum ferritin levels from 20-40ng/ml, moderate deficiency is from 10-20 ng/ml and severe deficiency is less than 10ng/ml. The serum ferritin level in cases ranged from 3.08 to 132ng/ml and in controls it ranged

from 5.8 to 332 ng/ml. The mean level of serum ferritin in patients was 23.53±28.66ng/ml and in controls it was 90.91±93.73ng/ml. In order to find out the difference in significance we performed Independent t- test. When we compared the equality of means and variance, the P-value of <0.05 was observed. Thus there is a significant difference between the levels of serum ferritin in cases and controls. The 95% confidence interval between the differences was -98.64 to -36.11.The standard error of difference was 15.69. Out of all the cases 41% had severe ferritin deficiency, 25.6% patients had moderate deficiency,17.9% had mild deficiency and the remaining 15.4% of the cases had normal values(>40ng/ml).The comparison between different groups in cases and controls is shown in the table below (Table 1).

Table 1. Comparison between the levels of serum ferritin in cases and controls in different categories

	Ferritin range(ng/ml)	Number/ Percentage	Cases	Controls	Total
Serum Ferritin Category	Severe deficiency (< 9.99)	Number	16	4	20
		%	41.0%	10.3%	25.6%
	Moderate deficiency (10.00-19.99)	Number	10	5	15
		%	25.6%	12.8%	19.2%
	Mild deficiency (20.00-40.00)	Number	7	8	15
		%	17.9%	20.5%	19.2%
	Normal (> 40.01)	Number	6	22	28
		%	15.4%	56.4%	35.9%
Total		Number	39	39	78
		%	100.0%	100.0%	100.0%

DISCUSSION

It is well known that iron plays an important role in the development of hair follicles. Iron is derived from various sources in the human body such as, nuts, dried fruits, legumes, dark leafy vegetables, oats, tofu and meat. Iron is involved in DNA synthesis. The expression of cell division control 2(CDC2), Ribonucleoside-diphosphatereductase subunit M2(RRM2) are increased in the bulge area of hair follicle, where as the expression of Decorin is decreased, consequently playing important role in hair growth and hair cycle.[7,8]The cut off value of ferritin deficiency was considered 40 ng/ml based on the study carried out by Sant' Anna Addor FA et al, in which sensitivity and specificity was 98%.[7]Normal serum ferritin levels in different studies ranged from 30-300ng/ml in males and 10-200ng/ml in females.[9,10]

Our study agrees with other prior studies depicting the notable association between low iron stores assessed by serum ferritin and hair loss in women. In one study conducted by Cheng et al ,where the total number of female telogen effluvium patients were 193 and controls were 183, there was a remarkable difference between the mean ferritin levels between cases and controls(p value<0.05).[11] The mean ferritin level in patients was 24.27±17.11ng/ml and in healthy controls it was 45.55±37.88ng/ml.[11]When this was compared with our study the mean ferritin levels of the cases were comparable as the level of ferritin in our study was 23.53±28.66ng/ml where as there was a huge difference in the mean values in healthy controls (45.55±37.88ng/ml against 90.91±93.73ng/ml in our study). In another study of 42 female telogen effluvium cases and 40 controls(age and sex matched) done by Rasheed H et al, the mean serum ferritin level in cases was 14.7±22.1ng/ml and in controls it was 43.5±20.4ng/ml.[12] In the same way several other reports also agree with our result.[13,14,15] On the contrary other studies found no significant difference in the levels of serum ferritin in telogen effluvium cases and controls.[16,17,18]Also in two separate studies done in Nepal in recent years, there was no positive correlation between telogen effluvium and serum ferritin levels.[19,20]

CONCLUSION

There were various studies contradicting each other in the relation between serum ferritin levels and telogen effluvium. Our study however showed a significant difference in the levels of serum ferritin

when compared between cases and controls(age and sex matched).Unlike other studies we have stratified the levels of serum ferritin deficiency into mild, moderate and severe deficiency, out of which more than 40% pateints had severe ferritin deficiency(<10ng/ml). The findings of our study helped in consolidating our understanding of the diagnostic value of serum ferritin in cases of telogen effluvium.

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