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A study to assess the relationship between female pattern hair loss and levels of serum 25 Hydroxyvitamin D and ferritin

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Abstract

Background: Female Pattern Hair Loss [FPHL] is the most common cause of diffuse hair loss in women. It is a result of altered hair follicle cycling and miniaturization, which leads to the transformation of terminal to villous hair follicles and the production of shorter finer hair shafts. The pathophysiology of FPHL is not well understood and it is likely to be a multifactorial genetic trait. Unlike in men, an androgen-dependent nature has not been proven in FPHL. Serum levels of vitamin D and Ferritin are factors recently considered in approaching patients with hair loss complaints.

Methods: A case control study with 30 FPHL cases and equal number of healthy controls was conducted among female patients between 17 and 50 years of age. Serum levels of 25 hydroxy vitamin D and Ferritin were measured and compared with the stage of the disease and other parameters.

Results: The serum ferritin values of the FPHL cases [17.02 +/- 16.07 ng/ml] were significantly lower than that of the controls [49.40 +/- 27ng/ml; p=0.001]. The serum 25 hydroxy vitamin D level in FPHL cases [15.98 +/- 7.33 ng/ml] were also significantly lower than that of controls [32.89 +/- 20.63ng/ml; p=0.001]. While comparing the serum ferritin with Ludwig's grading, a statistically significant difference between the grades of the disease was found with the lowest value in stage 1 disease. No statistically significant difference was found when grade of disease was compared with vitamin D status, although vitamin D status decreased with severity of the disease.

Conclusions: The levels of serum 25 hydroxy vitamin d and serum ferritin are decreased in patients with female pattern hair loss and the altered levels of these could be a risk factor for the development of the disease.

Keywords: Alopecia, ferritins, Vitamin D, female pattern baldness

Introduction

Patterned hair loss (PHL) continues to be one of the most important hair problems affecting both men and women. Female Pattern Hair Loss (FPHL) has been defined as non-scarring progressive miniaturization of the hair follicle, usually with characteristic pattern distribution that occurs in genetically predisposed women ^[1]. FPHL pathophysiology is not well understood and it is likely to be a multifactorial genetic trait. Unlike in men, an androgen-dependent nature has not been proven in FPHL. Most women with FPHL do not have clinical or biochemical Hyperandrogenism and response to anti androgen therapy is poor in FPHL, suggesting a possible role for non-androgen-dependent mechanisms ^[2]. Serum levels of vitamin D is a factor recently considered in approaching patients with hair loss complaints.

The possible link of Vitamin D and FPHL has not been studied thoroughly; although, there have been recent researches investigating the possible association hair disorders such as androgenetic alopecia, telogen effluvium and alopecia areata.

Also, low iron stores have been considered as a possible contributing factor for FPHL. Assessment of serum ferritin levels is therefore generally recommended as part of routine investigation and dermatologists commonly prescribe iron supplementation in women under the assumption that low iron store may be causing hair loss. However, contradictory data have so far failed to support this practice.

Thus, the objective of this study was to evaluate the serum 25-(OH) D and Ferritin levels in women with FPHL to determine the association, if any, between the FPHL and serum 25-(OH) D and Ferritin levels.

Materials and Methods

A case control study with 30 cases in the patient and control group respectively. 5 ml venous blood was taken in the morning from all participants with consent. Biodata and other details like stage of the disease, duration, other diseases, previous treatments taken was collected and entered in the data collection form. Laboratory investigations were carried out in the central laboratory of the institute. VIDAS automated immunoanalyzer which is based on the Enzyme Linked Fluorescent Assay-ELFA was used for the measurement of values. VIDAS KITS was used for both 25-OD Vitamin D and also for Ferritin. Serum levels of 25 hydroxy vitamin D and Ferritin was measured and compared with the stage of the disease and other parameters.

Results

The total number of cases were 30. Mean age was 28 with the youngest being 18 years and the eldest 41 years old. The average duration of the disease was 3 years. The ferritin values in the cases group ranged between 2.01 and 78.80 ng/ml with a mean of 17.02 +/- 16.07 ng/ml. The serum 25 hydroxy vitamin D level ranged between 5 and 32.4 ng/ml with a mean of 15.98 +/- 7.33 ng/ml. The total number of controls were 30. Mean age was 31 with youngest being 18 years and eldest 45 years old. The ferritin values in the control group ranged between 17.84 and 120.64 ng/ml with a mean of 49.40 +/- 27ng/ml. The serum 25 hydroxy vitamin D level ranged between 10.06 and 106.94 ng/ml with a mean of 32.89 +/- 20.63ng/ml.

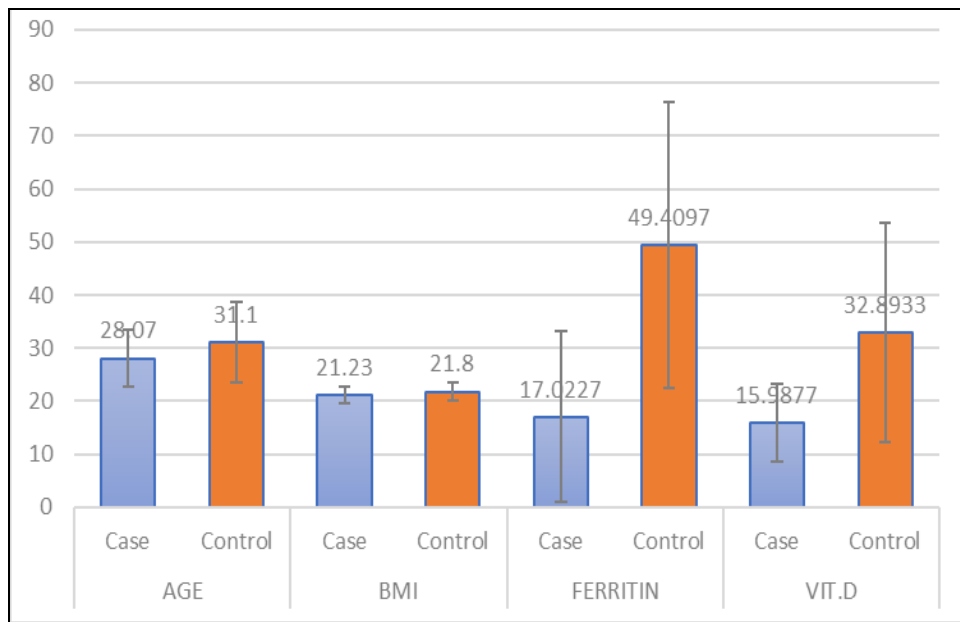


Fig 1: Comparison of the two groups among various variables

While comparing the serum ferritin with Ludwig’s grading, it was found that stage 1 had the lowest value of 12.74 +/- 5.90 ng/ml. stage2 and stage3 disease had a mean value of 21.78 +/- 6.74 and 21 +/- 1.14 ng/ml respectively. There was a statistically significant difference between the grades of the disease. On comparing vitamin D values with stage of

the disease, it was found that as the severity of the disease increases, vitamin D levels decreases. Stage 1, stage 2 and stage 3 diseases had 18.42 +/- 18.39, 15.78 +/- 12.42 and 9.5 +/- 6.36 ng/ml mean vitamin D values respectively. Serum vitamin D was lowest in the severe form of the disease. But this was not statistically significant [p=0.743].

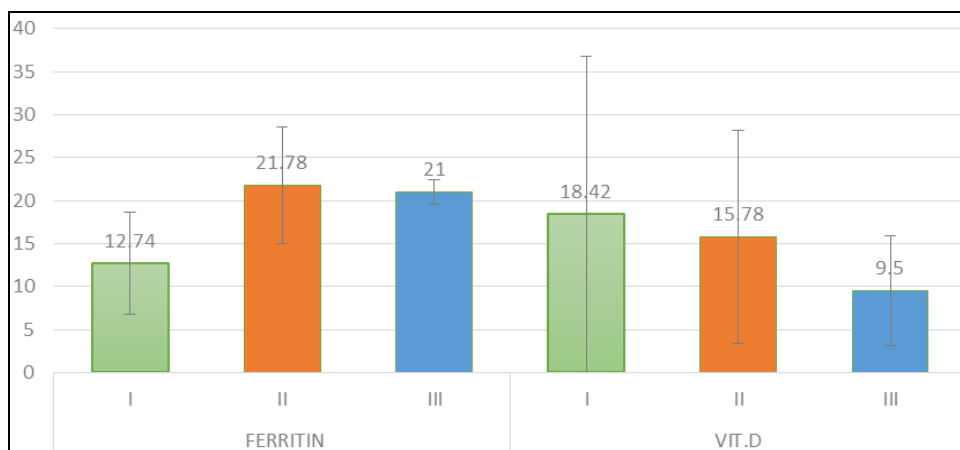


Fig 2: Comparison of the grade of disease among vitamin D and ferritin

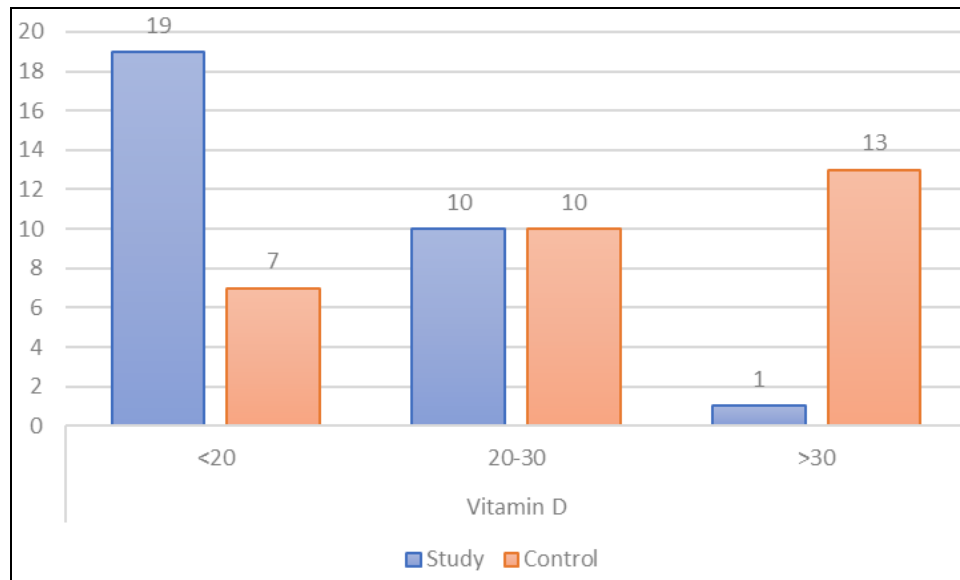


Fig 3: Differential analysis of Vitamin D

Differential vitamin D level assessment revealed a highly significant difference between patients and controls. Deficiency was more common among patients, whereas sufficient levels were found more often among controls. Of all the vitamin D deficient candidates, 73.1% were cases, while 93% of vitamin D sufficient participants were healthy controls. Sufficient levels were found in only 7% patients.

Discussion

The results of this study suggest that the reduced hair density seen in FPHL may possibly be associated with low serum levels of ferritin and vitamin D. This was evident from the significantly lower levels in the FPHL cases in comparison to the controls. Hair loss can potentially result in low self-esteem and poor body image, especially in women. The patients would have tried different shampoos and supplements promising hair regrowth before seeking the advice of a dermatologist. This and the chronic nature of the disease could explain the 3 years' average duration of the disease in the present study. It was evident from our study that the FPHL cases had a significantly low mean vitamin D values [15.98 ± 7.33 ng/ml], when compared with healthy controls [32.89 ± 20.63 ng/ml; $p=0.001$]. This finding most likely indicates the important role of deficient serum 25(OH)D levels in FPHL patients. Previous studies conducted on FPHL by many authors have also shown similar results. A study conducted by Moneib *et al.* reported a significantly lower serum 25(OH)D levels of 14.2 ± 7.31 ng/ml in patients with FPHL, whereas that of the control group was 45.90 ± 18.83 ng/ml ($P = 0.0001$) [3].

Differential vitamin D level assessment revealed a highly significant difference between patients and controls. Deficiency was more common among patients, whereas sufficient levels were found more often among controls. Of all the vitamin D deficient candidates, 73% were cases, while 93% of vitamin D sufficient participants were healthy controls. Sufficient levels were found in only 7% patients. A similar result was obtained by Moneib *et al.*, who reported 78.3% of FPHL cases to be vitamin D deficient, while 85% of controls had sufficient Vitamin D levels [3]. This implies the possible role of vitamin D deficiency as one of the important prerequisites to develop

FPHL. On comparing vitamin D values with stage of the disease, it was found that as the severity of the disease increases, vitamin D levels decrease. Serum vitamin D was lowest in the stage 3 of the disease. But this was not found to be statistically significant [$p=0.743$]. Rasheed *et al.* have found a significantly lower vitamin D in severe form of the disease [4]. Banihashemi *et al.* did not find any significant correlation between serum 25(OH) D concentration and grade of disease and attributed this to the high prevalence of Vitamin D deficiency in that country [5]. On comparing the mean serum ferritin values, we have found that the cases had a significantly low serum ferritin [17.02 ± 16.07 ng/ml] when compared with the controls [49.4 ± 27 ng/ml; $p=0.001$]. Ferritin below 40 ng/ml is considered to reflect reduced iron stores. This result agrees with various studies that have found low ferritin value in FPHL cases. Kantor *et al.* reported a significantly decreased serum ferritin concentration in subjects with AGA compared with healthy controls [6]. Rushton and Ramsay observed response to AGA treatment by Cyproterone acetate-ethinyl estradiol only in those with serum ferritin concentrations above 40 ng/mL [7]. Rushton *et al.* showed that almost three quarters of 50 premenopausal women with diffuse scalp alopecia had serum ferritin levels less than 40 ng/mL [8]. Rasheed *et al.* evaluated serum ferritin in females with telogen effluvium and FPHL and found that serum ferritin levels were significantly lower than that in controls [4]. But a case-control study by Aydingoz, Ferhanoglu, and Guney found no difference in the prevalence of IDA in hair loss subjects compared with control [9]. The different study designs adopted in different studies, the variability of the definition of a normal serum ferritin level in women, the different reference ranges used by different laboratories, and the genetic and ethnic variations of the study populations could be the reasons for the detected discrepancy. Nevertheless, the possibility of serum ferritin being unrelated to hair loss is also to be considered, taking into account the reported prevalence of a low serum ferritin level in some populations. All this makes comparing different studies complex.

While comparing the serum ferritin with Ludwig's grading, it was found that stage 1 had the lowest value of 12.74 ± 5.90 ng/ml, while stage 2 and stage 3 disease had a mean

value of 21.78 \pm 6.74 and 21 \pm 1.14 ng/ml respectively. There was a statistically significant difference between the grades of the disease. It shows that the low iron stores may cause the onset of the disease but the severity may not be affected. This may be explained in part by the “threshold hypothesis” proposed by Kantor *et al.* who reported iron deficiency in different forms of alopecia. The ‘threshold hypothesis’ stated that decreased iron stores lower the threshold for developing different types of alopecia [6]. At present, there are no studies evaluating the oral supplementation of vitamin D or its topical application in patients with FPHL. To address the question of whether or not correcting deficiencies of iron and vitamin D improves FPHL, further studies are warranted. There are several limitations to this study, including the relatively modest sample size. Objective tests like Trichogram and Dermoscopy or biopsy were not done. The role of Vitamin D and iron supplementation in improving hair growth were also not studied in the study group.

Conclusion

The results of this study suggests that the levels of serum 25 hydroxy vitamin d and serum ferritin are decreased in patients with female pattern hairloss and the altered levels of these could be a risk factor for the development of the disease. It is recommended to evaluate Vitamin D and Ferritin status in patients with FPHL to permit an earlier diagnosis of previously unidentified deficiency and for the initiation of appropriate treatment.

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Conflict of Interest

Not available

Financial Support

Not available

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