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ORIGINAL ARTICLE

Possible Association of Female-Pattern Hair Loss with Alteration in Serum 25-Hydroxyvitamin D Levels

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ABSTRACT

Background and Aim: Most women who experience diffuse hair loss suffer from female-pattern hair loss (FPHL). Several mechanisms other than androgen have been suggested as contributing to the process. Serum 25-hydroxy vitamin D [25-(OH) D] has been associated with other hair disorders. The present study aimed to assess the female-pattern hair loss possible association with variation in serum 25-hydroxyvitamin D levels.

Patients and Methods: This case-control study was conducted on 72 FPHL diagnosed female patients attending dermatology department of Tertiary Care Hospitals in Jamshoro and Karachi from November 2021 to October 2022. Females aged 18-40 years with skin prototypes III and IV were enrolled. About 72 healthy females were considered as control group. Study protocol was approved by the institutional research and ethical committee. Careful history, socioeconomic status, FPHL family history, menstrual history, and drug intake were recorded from cases and control. Patients were classified as having stage I, II, or III FPHL based on a clinical evaluation of the pattern of hair loss using Ludwig's scale. 25-OHD levels over a period of 4 months were measured to minimize seasonal bias. Females with 25-OHD levels <20 ng/ml were deficient, insufficient 21–29 ng/ml, sufficient >30 ng/ml, and intoxication >150 ng/ml. SPSS version 26 was used for data analysis.

Results: The overall mean age was 28.6±2.4 years. Age-wise distribution of patients were as follows: 9 (12.5%) in 18-25 years, 24 (33.3%) in 26-30 years, 21 (29.2%) in 31-35 years, and 18 (25%) 36-40 years. Serum 25-(OH) D levels in FPHL patients were significantly lower (15.4 ± 8.25 ng/ml) than in controls (46.42 ± 19.92 ng/ml). The mean vitamin D level did not differ significantly between patients with and without family history (14.46 ± 8.62 and 13.9 ± 8.24 ng/ml, respectively. The mean vitamin D level differed significantly between the three Ludwig's degrees (13.15 ± 8.49, 14.23 ± 6.74, and 24.9 ± 6.42 ng/ml, respectively): between degrees I and III, as well as between degrees II and III.

Conclusion: The present study showed that hair loss varied significantly across all age groups. Premenopausal women with vitamin D deficiency have higher rates of hair loss, which is most profound in the age groups 26-30, followed by 25-30. Furthermore, changes in serum 25-(OH) D levels, whether deficient or sufficient, may play a role in the etiology of FPHL.

Keywords: Female Pattern Hair Loss (FPHL), Vitamin D, Serum 25-hydroxy vitamin D

INTRODUCTION

Hair loss is a prevalent complaint in dermatological clinics and is generally accompanied with mental anguish and a poor health-related quality of life [1]. Women are more likely to suffer from diffuse hair loss caused by female-pattern hair loss (FPHL) [2]. The hair follicles cycle differently and shrink, resulting in shorter, finer hair shafts and vellus hair follicles [3]. The majority of women who experience diffuse hair loss have female-pattern hair loss (FPHL). Other than androgen, other pathways have been proposed as contributing to the process. Serum 25-hydroxy vitamin D [25-(OH) D] has been associated with additional hair problems such as alopecia areata and telogen effluvium [3-5]. FPHL has not been shown to be androgen-dependent. It has been shown that non-androgen-dependent processes are involved in the development of FPHL in most women with FPHL and can be acquired by women without circulating androgens [6-8].

Vitamin D is gaining popularity due to its nontraditional function as an immunomodulatory [9]. Vitamin D has been shown to have a function in reducing auto-attack and sustaining self-tolerance via vitamin D receptors (VDRs) produced by immune cells [10]. Reduced vitamin D levels have been connected to a variety of autoimmune disorders and inflammatory conditions, including rheumatoid arthritis, systemic sclerosis, and systemic lupus erythematosus [11]. Furthermore, VDRs are expressed in the keratinocytes of hair follicles, which is essential for the proper hair cycle [12]. The significant correlation between serum 25-hydroxyvitamin D [25-(OH)D] and FPHL has not been thoroughly investigated; however, recent studies have investigated the possible relation of serum 25-(OH) D and other hair diseases [13]. The postpone ageing phenomena such as hair loss, an adequate vitamin D concentration is required. It was advised that research on women with FPHL be done to evaluate whether there is a link between hair loss and changed serum 25-(OH) D levels [14]. The present study aimed to examine the serum 25-hydroxy vitamin D [25(OH) D] status in women with FPHL to identify the connection, if any, between FPHL and serum 25-(OH) D levels.

METHODOLOGY

This case-control study was conducted on 72 FPHL diagnosed female patients attending dermatology department of Tertiary Care Hospitals in Jamshoro and Karachi from November 2021 to October 2022. Females aged 18-40 years with skin prototypes III and IV were enrolled. About 72 healthy females were considered as control group. Participants with additional scalp hair conditions, whether primary or secondary, and those who were taking any medicines that might change serum vitamin D levels were excluded. Patients were classified as having stage I, II, or III FPHL based on a clinical evaluation of the pattern of hair loss using Ludwig's scale. Study protocol was approved by the institutional research and ethical committee. Careful history, socioeconomic status, FPHL family history, menstrual history, and drug intake were recorded from cases and control. 25-OHD levels over a period of 4 months were measured to minimize seasonal bias. Females with 25-OHD levels <20 ng/ml were deficient, insufficient 21–29 ng/ml, sufficient >30 ng/ml, and intoxication >150 ng/ml. Women of all ages who were examined for any skin disease and had their vitamin D level checked as part of their routine treatment were included in the study. Serum 25(OH)D levels were used to determine vitamin D status, which was graded as mild, moderate, or severe. Clinical findings (hair loss pattern, central part widening, and hair density reduction over the crown), dermoscopy abnormalities predominance in the frontal area compared with the occipital area, and a positive hair pull test were used to make the diagnosis of FPHL. These irregularities include an activities leading of thin and vellus hairs, variability in hair shaft thickness, perifollicular colouring (hyperpigmentation), and the presence of

varying numbers of yellow spots. The variance analysis test was used to determine the statistical significance of a difference between the study groups. The Student's t-test was performed to determine the statistical significance of the difference between the two study groups. A P-value of 0.05 or less was regarded as significant (S).

RESULTS

The overall mean age was 28.6±2.4 years. Age-wise distribution of patients were as follows: 9 (12.5%) in 18-25 years, 24 (33.3%) in 26-30 years, 21 (29.2%) in 31-35 years, and 18 (25%) 36-40 years. Serum 25-(OH) D levels in FPHL patients were significantly lower (15.4 ± 8.25 ng/ml) than in controls (46.42 ± 19.92 ng/ml). The mean vitamin D level did not differ significantly between patients with and without family history (14.46 ± 8.62 and 13.9 ± 8.24 ng/ml, respectively. The mean vitamin D level differed significantly between the three Ludwig's degrees (13.15 ± 8.49, 14.23 ± 6.74, and 24.9 ± 6.42 ng/ml, respectively): between degrees I and III, as well as between degrees II and III. Figure-1 illustrate the age-wise distribution of patients. Table-I represents the co-occurrence of hair loss associated with vitamin D levels. Table-II shows the vitamin D levels in cases and controls. The association between Ludwig's degree and patients' mean serum 25-hydroxyvitamin D levels are shown in Table-III.

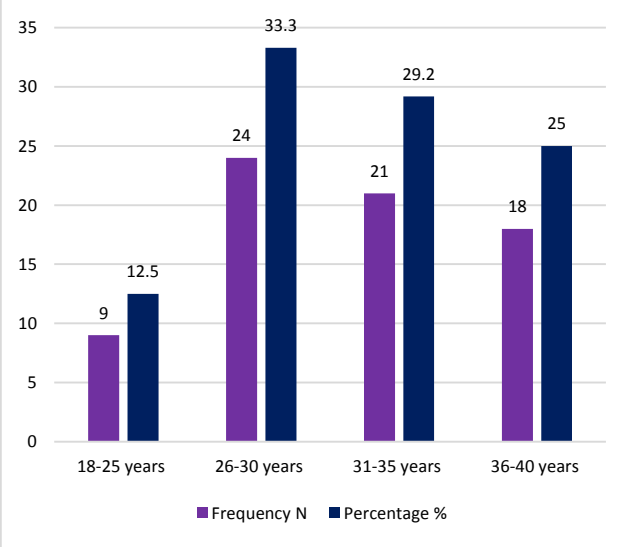

Figure-1: Age-wise distribution of patients (n=72)

Table-1: co-occurrence of hair loss associated with vitamin D levels (n=72)

Vitamin D status	Patients N	Hair loss
Severe vitamin D deficiency (<12 nmol/L)	0	0
Vitamin D deficiency (12 - 25 nmol/L)	7	5
Vitamin D insufficiency (25 - 50 nmol/L)	16	11
Marginal vitamin D status (50 - 75 nmol/L)	26	17
Vitamin D sufficiency (75 -150 nmol/L)	23	15
Risk of toxicity (>375 nmol/L)	0	0
Total	72	48

Table-2: vitamin D levels in cases and controls

Vitamin D status	Cases (N=72) N (%)	Control (N=72) N (%)	P-value
Sufficient vitamin D Yes No	 3 (4.2) 69 (95.8)	 61 (84.7) 11 (15.3)	0.0001
Insufficient vitamin D Yes No	 14 (19.4) 58 (80.2)	 72 (100) 0 (0)	0.06
Deficient vitamin D Yes No	 58 (80.6) 14 (19.4)	 12 (15) 60 (85)	0.0001

Table-3: Association between Ludwig's degree and patients' mean serum 25-hydroxyvitamin D levels

Ludwig's classification Degree	25-(OH)D level (mean ± SD) (ng/ml)	P-value
Degree 1	13.15 ± 8.49	0.005
Degree 2	14.23 ± 6.74	0.005
Degree 3	24.9 ± 6.42	0.005

DISCUSSION

The present study investigated the female-pattern hair loss possible association serum 25-hydroxyvitamin D levels alteration and found that Hair loss varies greatly by age group. Premenopausal women with vitamin D insufficiency experience more hair loss, which is most severe in the age groups 26-30, followed by 25-30. Serum 25-(OH) D levels either insufficient or sufficient, may also be involved in the genesis of FPHL. Serum 25-hydroxycholecalciferol levels have recently been associated to FPHL [15]. Monieb found that FPHL patients had lower serum vitamin D levels than controls [16]. In this study, 95.2% of FPHL patients had low blood vitamin D levels, with just 4.8% falling within the normal range. A link was discovered between vitamin D levels and the severity of FPHL. There was no correlation discovered between the degree of hair loss and the length of the ailment, or between the patient's ages [18].

Rasheed [19] and Banihashemi [20] similarly found an association between the severity of FPHL and lower vitamin D levels, albeit their conclusions on the relevance of a positive family history differed. Fawzi [21] discovered less vitamin D receptors in alopecia areata and AGA patients, but a larger quantity in FPHL patients. One proposed reason is that the combination of 17 beta oestradiol and 1, 25 dihydroxycholecalciferol leads in increased gene expression [22].

Earlier studies [23, 24] reported that a low vitamin D level was associated with hair loss, implying a role in the cause and/or pathophysiology of hair loss and thinning processes. Its presence in AA, AGA, and FPHL supports connection rather than causation [25]. It is hypothesized that mental distress caused by changing appearance may prevent or limit time spent outside [26]. Lowering UVB exposure, resulting in lower cholecalciferol production.

We found similar results to those of a previous study [27] of 42 TE females, 38 FPHL females, and 40 age-matched healthy female controls. Women with TE and FPHL were significantly lower in mean blood vitamin D levels (28.8 10.5 nmol/l) than controls (118.2 68.1 nmol/l), suggesting that low serum vitamin D levels may contribute to the decreased hair density reported in chronic TE and FPHL patients. There was a significant difference between patients and controls in terms of their vitamin D levels. Patients with an inadequate intake of vitamin D (47 patients, 78.3%) had a greater tendency to have a deficiency of vitamin D (51 controls, 85%), suggesting a role for vitamin D deficiency in hair loss.

Serum 25-(OH) D concentrations are thought to decline with ageing [28]. However, we were constrained in our capacity to analyze the relationship between serum 25-(OH)D status and age in this study since the whole cohort was young, as individuals were recruited from the start within a small age range. A multivariate analysis was performed after age adjustment to study the effect of vitamin D deficiency on the occurrence of FPHL, and it was discovered that women with insufficient/deficient vitamin D levels would have 177.7 times the risk of developing FPHL compared to women with sufficient vitamin D levels. Those with insufficient or deficient 25-(OH) D levels with a positive FH have a greater chance of developing FPHL than women with adequate levels. To identify previously unknown vitamin D deficiency/insufficiency in women with FPHL and to begin appropriate treatment sooner, serum 25-(OH) D levels should be measured.

CONCLUSION

The present study showed that hair loss varied significantly across all age groups. Premenopausal women with vitamin D deficiency

have higher rates of hair loss, which is most profound in the age groups 26-30, followed by 25-30. The etiology of FPHL could also be related to changes in 25-(OH) D levels in the blood, whether sufficient or deficient.

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