Incidence of Vitamin D Deficiency in Patients with Female Pattern Hair Loss (FPHL)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Background: Female pattern hair loss is also observed in women without increased androgen levels. Vitamin D is a factor that has recently been considered in dealing with these patients. Deficiency of Vitamin D might be correlated with diffuse hair loss.
Objective: To determine the frequency of serum levels of Vitamin D3 in patients with female pattern of hair loss (FPHL) at tertiary care hospital Karachi.
Methodology: This cross-sectional research was conducted upon a sample of 163 female patients (chosen via non-probability – consecutive sampling) presenting to the Dept. of Dermatology, Abbasi Shaheed Hospital, Karachi from 29th July 2018 to 28th January 2019, with a clinical diagnosis of FPHL. Data was recorded onto a structured questionnaire containing inquiries pertaining to basic biodata, sociodemographic details, and inferences obtained from blood tests (CBC, serum ferritin, TSH level and vitamin D level). Serum 25 OH Vitamin D level < 20 was taken as deficient, 21-29 was insufficient and over 30 was sufficient. Data was analyzed using SPSS. v. 21.0.
Results: The mean age was 30.39±6.36 years. Mean FPHL duration was 5.85±2.89 months. Total

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63.2% patients were classified as mild, 26.45% patients were classified as moderate and 10.4% patients were classified as severe. Total 73% patients were found as vitamin D deficient, 22.1% as vitamin D insufficient and 4.9% as vitamin D sufficient. Significant association of vitamin D deficiency was observed with education status, vitamin D intake since past 6 months, and socio economic status.

Conclusion: Results showed high vitamin D3 deficiency (73.0%) among patients with female pattern of hair loss (FPHL).

1. INTRODUCTION

Female pattern hair loss (FPHL) is the most common hair loss disorder in women. Currently available therapies for FPHL are unsatisfactory. [1]. It is the most common cause of alopecia involving 6-12% of women aged 20-30 years and over 55% of women over 70 years of age [2].

FPHL is also observed in women without increased androgen levels, which raises the likelihood of androgen-independent mechanisms and explains the lack of response to antiandrogen treatments in some patients. Vitamin D is a factor that has recently been considered in dealing with these patients [3].

Hair fall is a common problem faced by many younger people, which has variety of risk factors. Female Pattern Hair Loss or female androgenic alopecia is the main cause of hair loss in adult women [4]. The prevalence of FPHL varies among population groups and increases with age [5]. Mostly, women visit a dermatologist for hair loss, due to its effect on their cosmetic appeal [6].

Most people have about 100,000 scalp hair among which 10%–15% are in telogen phase. Loss of 100–150 telogen hair is considered normal [7], but hair loss in anagen phase is abnormal. Diffuse hair loss is triggered by many factors such as physiological stress, emotional stress, various medical conditions, and dietary deficiencies. Deficiency of Vitamin D might be correlated with diffuse hair loss [2].

Vitamin D deficiency (25-hydroxyvitamin D–Vitamin D3) affects over one billion people worldwide. Vitamin D is important in a number of physiologic processes, including calcium absorption, innate and adaptive immunity, and homeostasis of a number of organs. Vitamin D deficiency is widespread throughout the world [8]. Unfortunately, there is high prevalence of vitamin D deficiency due to lack of proper diet and poor calcium intake [9]. High rates of vitamin D deficiency in Pakistan despite high levels of sunshine and previous Food Acts asking for food fortification with vitamin D [10].

A study of Nayak, Kashinath, et al. [11] 2016 to compare the vitamin D level in patients with pattern of hair fall loss. According to this study the vitamin D a total of 44 subject was collected. 81.8% cases had found Vitamin D deficient. Another study published in 2014 by Moneib, H et al. [12]. Among 60 patients, 47 patients (78.3%) showed a deficient level of vitamin D (<20 ng/ml), and 11 patients (18.3%) showed insufficient vitamin D levels (21-29 ng/ml) in patients of female-pattern hair loss.

Female pattern hair loss (FPHL) is related with decreased serum levels of 25 OH vitamin D3. As such studies are still an issue under debate and are very limited in our region. Up to my knowledge no study has been conducted in our region as well as South Asia. After extensive research, only 2, 3 studieswere found which were done in Eastern Europe and Egypt by Moneib H, & Fathy G, Ouda A et al. [6,12]

The aim of this study was to shed light on this territory through estimating the status of vitamin D in female patients with FPHL. Low serum 25 OH vitamin D3 is associated with hair loss in females with FPHL. Screening to establish these levels in cases of hair loss and supplementing with them when they are deficient may be beneficial in the treatment of disease. Therefore, this study will also provide counseling of its management and prognosis.

2. METHODOLOGY

This cross-sectional research was conducted upon a sample of 163 female patients (chosen via non-probability – consecutive sampling) presenting to the Dept. of Dermatology, Abbasi

Shaheed Hospital, Karachi from 29th July 2018 to 28th January 2019, with a clinical diagnosis of FPHL. Data was recorded onto a structured questionnaire containing inquiries pertaining to basic biodata, sociodemographic details, and inferences obtained from blood tests (CBC, serum ferritin, TSH level and serum 25 OH vitamin D level). Vitamin D level < 20 was taken as deficient, 21-29 was insufficient, and over 30 was sufficient. Data was analyzed using SPSS. v. 21.0.

2.1 Inclusion Criteria

1. Female Patients with clinical diagnosis FPHL (as defined per operational definition) in age between 15–45 years of age with hair fall duration less than one year were included.
2. Those Patients with complaints of hair fall of more than 100 strands per day (self-rated) were included in the study.
3. Women patients with BMI between 18.5 to 24.9 kg/m^2

2.2 Exclusion Criteria

1. Patients who have use topical treatment with Vitamin D3 compounds or systemic therapy (phototherapy) within the past month were excluded
2. Female patients who had taken Vitamin D supplements within 6 Months
3. Pregnant and lactating females
4. Chemotherapy or those taken it less than 1 year back
5. Patients with hair fall secondary to any other reason like alopecia areata, scarring alopecia, trichotillomania.

3. RESULTS

The overall mean age of patients was 30.39±6.36 years (range 19 to 42 years). The detailed descriptive statistics of age, weight, height and BMI are tabulated below:

Out of 163 patients, 68.7% patients were married and 31.3% were unmarried. Educational graph showed that 20.2% females were illiterate, while 24.5%, 31.3% and 23.9% females had education up to primary, secondary and intermediate level & above respectively.

The overall mean duration of FPHL was 5.85±2.89 months. The detailed descriptive statistics of FPHL duration and other key aspects such as serum vitamin D level,are tabulated below.

Stratification with respect to age, marital status, education status, Ludwig classification, positive family history, vitamin D intake history since past 6 months and socio economic status was done to observe effect of these modifiers on vitamin D category. P value ≤ 0.05 was considered as significant. The results showed that there was significant association of vitamin D category with education status (P=0.001), vitamin D intake since past 6 months (P=0.000) and socio economic status (P=0.000). No significant association was found with age (P=0.548), marital status (P=0.788), Ludwig classification (P=0.489) and positive family history (P=0.299). The detailed results of associations are presented below

Table 1. Descriptive statistics of age, weight, height and BMI

Variable	Mean	SD	Median	Range	Min	Max
Age	30.39	6.36	30	23	19	42
Weight	58.90	3.83	60	15	50	65
Height	160.47	4.58	160	15	150	165
BMI	22.86	1.28	23	5.40	19.50	24.90

Table 2. Key aspects of serum vitamin D level

Variable	Mean	SD	Median	Range	Min	Max
FPHL Duration	5.85	2.89	06	10	01	11
Serum Vitamin D	16.73	7.14	14.3	28.3	7.20	35.5

Table 3. Vitamin D category associations

Variable		Vitamin D category			Total	P Value
		Deficient	**Insufficient**	**Sufficient**		
Socioeconomic Status	Lower	33 (82.5%)	07 (17.5%)	00	40	
	Middle	66 (75%)	22 (25%)	00		
	Higher	20 (57.1%)	07(20%)	08 (22.9%)		0.000*
Vitamin D Intake in Past 6 Months	Yes	01(2.5%)	31(77.5%)	08(20%)	40	
	No	118 (95.9%)	05 (4.1%)	00	123	0.000*
Family History of FPHL	Yes	28 (77.8%)	09 (22.2%)	00	36	0.299
	No	91(71.7%)	28 (22%)	08 (6.3%)	127	
Ludwig Classification	Mild (Type 1)	73(70.9%)	25(24.3%)	05(4.9%)	103	
	Moderate (Type 2)	34(79.1%)	06(14%)	03 (7%)	43	
	Severe (Type 3)	12(70.6%)	05(29.4%)	00	17	0.489
Educational Status	Illiterate	24(87.1%)	04(12.9%)	00		
	Primary	27(87.1%)	04(12.9%)	00	38	
	Secondary	39(94.3%)	20(32.8%)	02(3.3%)	61	
	Inter or above	23(69.7%)	04(12.1%)	06(18.2%)	33	0.001*

4. DISCUSSION

In our study; mean age was 30.39±6.36 years. Mean BMI was 22.86±1.28 kg/m^2. The mean FPHL duration was 5.85±2.89 months. 68.7% patients were married and 31.3% were unmarried. As far as severity of FPHL was concerned, it was observed that 63.2% patients were classified as mild (Type I), 26.45% patients were classified as moderate (Type II) and 10.4% patients were classified as severe (Type III). It was observed that 22.1% were found with positive family history while 24.5% patients' intake vitamin D since past 6 months. 24.5% were belonged to lower socioeconomic class, 57.1% from middle socioeconomic class and 18.4% from upper socioeconomic class.

In our study the serum 25 OH vitamin D3 was 16.73±7.14 ng/mL. Total 73% patients were found as vitamin D deficient, 22.1% as vitamin D insufficient and 4.9% as vitamin D sufficient. In a study done by Rasheed et al. in [13] in Egypt, serum Vitamin D3 level in FPHL was significantly lower than the control group. According to this study, low level of Vitamin D3 is associated with hair loss in women with FPHL. A screening test is useful to measure Vitamin D3 level in women referring with hair loss, and dietary supplements can be useful to treat these patients [14]. Similarly, Banihashemi et al. [15] in case-control study reported significant difference in vitamin D levels between the FPHL patients and control group.

Factors significantly associated with a higher influence for FPHL in the female population included earlier puberty, fewer childbirths, and longer oral contraceptive use. In contrast, women who breast-fed or had shorter menstruation durations had a lower risk for FPHL after adjusting for age and family history. However, it seems that higher estrogen exposure might be positively associated with FPHL, and prolactin (breast-feeding) might be associated with decreased risk of the disease [3]. In addition, hair follicles have been reported to be both a target and a source of prolactin [16] a hormone with potent hair growth modulating properties in human beings [17].

Extensive studies on animal models showed that VDR plays an important role in the cycle of the hair follicle, especially in the anagen phase. It has recently been shown that 1,25(OH)$_2$-D, VDR, and β-catenin stimulate the differentiation of hair follicle [17]. Environmental factors such as longitude, season, weather conditions (e.g., cloudy) and air pollution affect Vitamin D3 level in serum [18].

In our study the severity of hair loss was Ludwig I in the majority of patients (63.2%), which was similar to the study of Sarda et al. [19] (66%) and Banihashemi et al. [15] (66.7%). In the studies conducted by Zhang et al. [20] and Aktan et al. [21]; Ludwig I pattern was the most common in FPHL patients. A positive family history was present in 22.1% patients in our study. Zhang et al. [22] and Sarda et al. [19] showed that 27.3%

and 38% of patients had a family history of FPHL in their studies respectively, which is consistent with our study.

The results of the study of Moneib et al. [23] showed highly significant difference between the three Ludwig's degrees with regard to the mean serum 25-(OH) vitamin D level was found, which revealed differences between degrees I and III and between degrees II and III. Surprisingly, the mean level was the highest in degree III compared with degrees I and II; the reason for this increase in 25-(OH) vitamin D levels in patients was not known.

There were many suggested mechanisms by which vitamin D might have a possible influence on hair follicle cycling and growth. It has been suggested that an optimal concentration of vitamin D is necessary to delay aging phenomena, including hair loss. There was an observable recovery of alopecia areata with reduced vitamin D receptor expression after topical application of calcipotriol, a strong vitamin D analogue, after failure of response to various treatments.

5. CONCLUSION

The results of our study showed high serum 25 OH vitamin D3 deficiency (73.0%) among patients with female pattern of hair loss (FPHL) and it is recommended to evaluate serum D3 level along with other hormonal assays to check the patient's status. Further, significant association of vitamin D deficiency was observed with education status, vitamin D intake since past 6 months, and socioeconomic status.

6. STUDY LIMITATIONS

Our study had several limitations. This is a single-center study, with small sample size, lack of control subjects and non-randomized study design. We also lacked a standard monitor to assess the diet of FPHL patients, and we can't measure the amount of daily dietary intake of vitamin D3 or its precursors in our patients. Our study was conducted in an urban environment; therefore, the results might not be generalizable to larger population groups.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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