Dermatology Practical & Conceptual

Filling the Gaps: Vitamin D Status in Diffuse Hair Fall Among Pakistanis

Palwasha Jalil[1], Sadia Masood[2], Muhammad Sadique[3], Maimoona Abdul Jalil[4], Malghalura Jalil[5], Laila Khan[6]

1 Consultant Dermatologist at (Aria Institute of Medical Sciences Quetta)
2 Associate professor of Dermatology at Aga khan University Hospital Karachi
3 Consultant Nephrologist at Balochistan Institute of Nephrology and Urology Quetta
4 Lecturer of physiotherapy at Indus Hospital Karachi
5 Consultant Gynecology and Obstetrics, Aria Institute of Medical Sciences Quetta
6 Consultant Ophthalmologist at Helper Eye institute Quetta

Key Message: Our study underscores a significant link between low vitamin D levels and diffuse hair fall in Pakistani patients. A substantial number of individuals with hair loss were found to have inadequate vitamin D levels, highlighting the importance of considering vitamin D status in managing hair health.

Key words: alopecia areata, diffuse hair fall, pattern hair loss, vitamin D3

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Corresponding Author: Palwasha Jalil, Aria Institute of Medical Sciences Quetta; Phone: 03151820220; E-mail: drhilmand@gmail.com

ABSTRACT

Introduction: Hair loss can happen for various reasons, including emotional stress, physical strain, certain medical issues, and nutritional gaps. When it comes to nutrition, a lack of vitamin D3 could be linked to diffuse hair loss.

Objectives: The aim was to look for the frequency of vitamin D3 deficiency with diffuse hair fall, especially in the Pakistani population.

Methods: A total of 120 patients of both sexes and all ages presenting to the Dermatology Clinic with complaints of non-scarring alopecia and loss of over 100 strands of hair within a 24-hour period (counted by patient) of any duration and positive hair pull test were advised to take serum vitamin D3. Tests and results were then analyzed by SPSS statistical software package (version 19.0 for Windows).

Results: The mean age of participants enrolled in the study was 28.56 ± 11.62 years. The majority of the patients, i.e., 77 (63.64%), were ≤30 years of age. Among the 120 patients, 17 were males and 103 were females. Mean serum vitamin D3 levels were 17.33 ± 5.43 ng/ml. 95 (79.17%) patients

were found to be vitamin D3 deficient, with 37 patients having female pattern hair loss, seven patients with male pattern hair loss, seven patients with diffuse alopecia areata, and 44 patients with telogen effluvium.

Conclusions: This study concluded that there is considerable frequency of vitamin D3 deficiency in individuals with diffuse hair fall. Therefore, we recommend that there should be early recognition and treatment of this condition in these particular patients in order to reduce hair fall.

Introduction

Hair loss is frequently reported as a common concern among patients seeking care at dermatology clinics. It is often a distressing problem with a great effect on the social and psychological well-being of a person. Hair is not only an accessory and important aesthetically, but it also reflects many diseases, both systemic and localized to scalp.

Around 100,000 hair follicles exist on the scalp of a healthy human, each going through various stages of the hair cycle simultaneously. A problem in any of the three stages of the hair cycle, i.e., anagen (active growth stage), catagen (stage of regression), or telogen (resting stage), can cause loss of hairs [1]. Hair fall, generally called alopecia, is defined as the loss of more than 100–150 hairs in the telogen phase [2].

Hair fall can broadly be classified into two classes according to the area of involvement: diffuse and focal hair fall [3]. Hair loss can happen for various reasons, including emotional stress, physical strain, certain medical issues, and nutritional gaps. When it comes to nutrition, a lack of vitamin D3 could be linked to diffuse hair loss [4, 5].

Vitamin D has an indispensable role in human health maintenance, growth, and development. It is a steroid with hormone-like activity. Vitamin D is acquired through diet, and its synthesis also happens under UV-B light (290-315 nm) effect in epidermal keratinocytes [6]. Observations from studies conducted on animals suggest that vitamin D3 plays a significant part in various stages of the hair follicle cycle [7]. This fact has been strengthened by some more studies carried out in patients having hereditary vitamin D receptor (VDR) deficiency, which showed a correlation between vitamin D3 levels and alopecia in these individuals [8]. On the other hand, more than one billion people are affected by vitamin D deficiency (25-hydroxyvitamin D) worldwide [9]. It is emerging as an epidemic involving every segment of the population irrespective of sex and age. Studies done in Pakistan showed 53.5% of the population to be vitamin-D3 deficient, 31.2% with low vitamin D3, and a mere 15.3% having sufficient vitamin D [10]. A previous study reported that 81.8% of patients presenting with diffuse hair fall in the clinics have vitamin D deficiency [2].

Objectives

Our study sought to explore the frequency of vitamin D3 deficiency with diffuse hair fall. Numerous studies conducted in different parts of the world have indicated a significant connection between lower levels of vitamin D3 and hair loss [2, 4, 5, 8, 11]. More than 50% of the Pakistani population is suffering from vitamin D3 deficiency [10], but local data for the deficiency of vitamin D3 in patients having diffuse hair fall are not available.

Methods

Following the approval of the ethics review committee at a tertiary care hospital, we conducted this descriptive cross-sectional study in the department of dermatology over a 6-month period. A total of 120 patients of both sexes and all ages presenting in the dermatology clinic for complaints of non-scarring alopecia with a loss of over 100 strands of hair within a 24-hour period (counted by patient) of any duration and positive hair pull test (about 10% of hairs are easily pulled away from the scalp) were included. Patients who had been taking vitamin D supplements within one year or had anemia, thyroid abnormalities, bone diseases, or renal failure were excluded. Informed consent was taken from each patient. The hair pull test was performed, and a serum vitamin D3 test was recommended. The principal investigator then entered the data into the proforma.

Statistical Analysis

We analyzed the results using the SPSS statistical software package (version 19.0 for Windows). The continuous variables, such as duration, vitamin D3 levels, and age, are described using mean ± SD. Frequencies (%) were computed for categorical variables (male, female, vitamin D3 deficient yes and no, female pattern hair loss, male pattern hair loss, diffuse alopecia areata, telogen effluvium) for the characteristics of participating subjects. Vitamin D3 levels were categorized as either less than 20 ng/ml or more than 20 ng/ml.

To manage effect modifiers like age, sex, and duration, we implemented stratification. Subsequently, a chi-square test with post-stratification was performed, using a significance level of $P \leq 0.05$.

Results

The mean age of the patients enrolled in the study was 28.56 ± 11.62 years. Most of the patients, i.e., 77 (63.64%), were ≤30 years of age. Mean duration of disease was 3.76 ± 2.38 years (Table 1). Of the 120 patients, 17 (14.17%) were males and 103 (85.83%) were females, with a male-to-female ratio of 1:5.7. The distribution of patients according to diagnosis and stratification for vitamin D3 deficiency with respect to age group, sex, duration, and diagnosis of disease is shown in Table 1.

Mean serum vitamin D3 levels were 17.33 ± 5.43 ng/ml. Frequency of vitamin D3 deficiency in patients with diffuse hair fall was seen in 95 (79.17%) patients (figure I), with 37 patients having female pattern hair fall, seven patients with male pattern hair fall, seven patients with diffuse alopecia areata, and 44 patients with telogen effluvium.

Discussion

It is a well-known fact that 1,25-$(OH)_2$ D exerts its effects when it attaches to vitamin D receptor (VDR). VDR is distributed throughout the body in appendageal structures like hair follicles, in immune and other system cells involved in bone and calcium metabolism [12]. The expression of VDR in the mesenchymal dermal papilla cells and epidermal keratinocytes varies based upon the phase of the hair cycle [13]. Considering this perspective, several studies have been conducted, such as the one by Dorach et al., exploring the connections between serum vitamin D levels, disease severity, and the expression of the vitamin D receptor (VDR) in hair follicles of patients with alopecia areata (AA). The authors compared 30 AA patients with 30 healthy controls and found that 96.7% of AA patients had vitamin D deficiency, while only 73.3% of healthy controls were deficient. The duration of the disease and severity negatively correlated with serum vitamin D levels, but there was no correlation between the VDR expression on the hair follicles and the pattern of AA. In tissue samples obtained from the patients, VDR expression was diminished in all of them and remained within the standard range in the control group. Additionally, it was found that VDR expression was significantly reduced in areas of increased inflammation [14].

Many other studies have explored the involvement of vitamin D in telogen effluvium (TE), with conflicting results. Rasheed et al. [15] and Nayak et al. [2] documented that female patients with TE were found to have significantly reduced serum vitamin D levels compared to their healthy controls, with the most diminished levels observed among individuals with the most pronounced hair loss. This implies a potential role of vitamin D in TE. However, Karadag et al. discovered notably elevated serum vitamin D levels in TE patients compared to the control group. Interestingly, a higher concentration of serum 25(OH) D in the upper quadrant was linked with an increased likelihood of having TE. The authors proposed that the noted rise in serum vitamin D levels in patients with TE could be a compensatory response to hair loss rather than the cause [16]. Similarly, Yilmaz et al. documented no notable connection between 1,25 $(OH)_2$ D levels and the severity of hair fall, the duration of the disease, the count of patches, or nail involvement in 42 patients with AA [17]. However, further studies reported a correlation between these factors. The differences in results could be due to variations in enrollment criteria, including AA severity and

Table 1. Stratification of vitamin D3 deficiency with respect to demographic variables and disease diagnosis.

		No of Patients	Vitamin D3 Deficiency		P-Value
			Yes	No	
Age (years)	**≤16**	12	10	02	**0.708**
	>16	108	85	23	
Duration (years)	**≤5 years**	89	72	17	**0.429**
	>5 years	31	23	08	
Sex	**Male**	17	14	03	**0.727**
	Female	103	81	22	
Diagnosis	**Male pattern hair loss**	08	07	01	**0.137**
	Female pattern hair loss	53	37	16	
	Diffuse alopecia areata	09	07	02	
	Telogen effluvium	50	44	06	

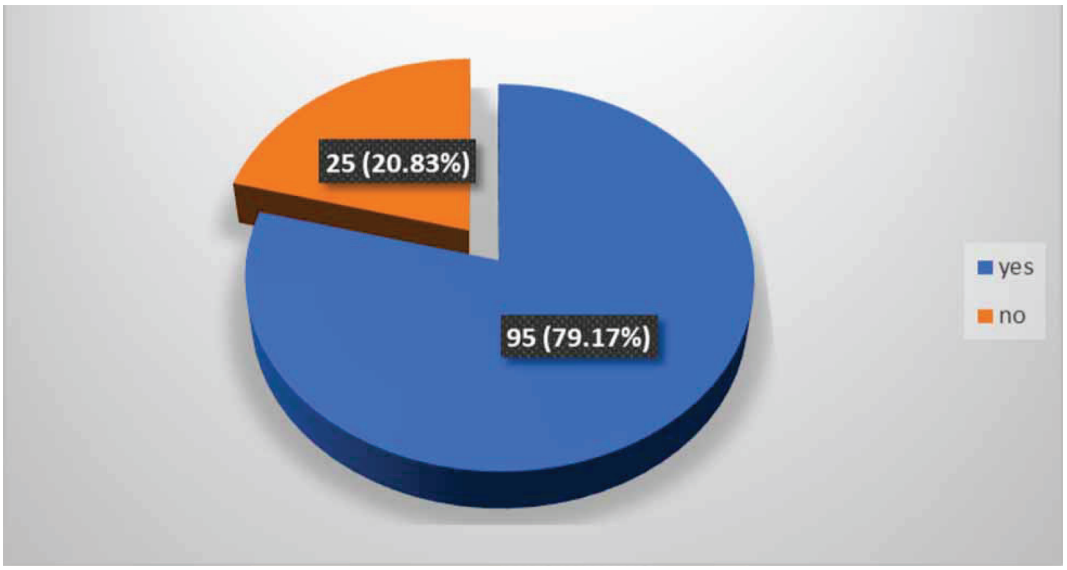

Figure 1. Frequency of vitamin D3 deficiency in patients presenting with diffuse hair fall (n=120).

patient numbers, or seasonal variations in serum 25(OH) D levels. Aksu Cerman et al. [18] carried out their study in winter, while Yilmaz et al. conducted theirs in the summer. Additionally, there are inconsistent findings regarding the serum vitamin D levels of female and male AA patients. Some studies report lower levels in males, while others report the opposite or no association with sex. This variation could be influenced by cultural and religious factors affecting vitamin D formation [18-21].

Conclusion

Keeping in mind the sparsity of similar data in the Pakistani population, in this study, the aim was to ascertain the frequency of vitamin D3 deficiency in patients with diffuse hair fall. The results showed that out of the 120 patients with diffuse hair fall, including female pattern hair fall (n=37), male pattern hair fall (n=7), diffuse alopecia areata (n=7), and telogen effluvium (n=44), 95 (79.17%) had vitamin D3 deficiency which is significantly low enough to conclude the necessity of inquiring about any vitamin D deficiency-related symptoms, advising the relevant investigations, and then replenishing the deficiency in the patient presenting with hair fall as the early recognition and treatment of this condition may help reduce hair fall. However, it is important to acknowledge that our study's small sample size (n=120) is a limitation, and future studies with larger samples are needed to confirm and generalize our findings.

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