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Evaluation of Serum Level of Vitamin D in Patients with Female Pattern Hair Loss Thesis

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Authors' contributions

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

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ABSTRACT

Background: Female pattern hair loss (FPHL) is the most common cause of alopecia in women, characterized by diffuse non-scarring hair loss in frontal, central, and parietal areas of the scalp. Vitamin D is a factor that has recently been considered in dealing with these patients.
Objective: The aim of this work was to evaluate the serum level of 25 hydroxy vitamin D in patients with FPHL to elucidate its possible role in the pathogenesis of the disease.
Methods: This study included 45 patients with female pattern hair loss; Evaluation of vitamin D level by Elisa was done for both control and patients.
Results: Regarding vitamin D levels, mean ± SD. 18.0 ± 11.97.
Conclusion: This study indicated the correlation between FPHL and decreased serum levels of Vitamin D3. It is recommended to evaluate serum Vitamin D3 levels as well as other hormone assays in these patients.

Keywords: Female pattern hair loss (FPHL); Vitamin D; Hormone.

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1. INTRODUCTION

FPHL is clinically characterized by diffuse non-scarring hair loss without obvious hair thinning in frontal, central, and parietal lobes of the scalp. The frontal hairline is characteristically maintained. A similar pattern is observed in men with miniaturized follicles and is known as androgenic alopecia. FPHL designation is preferred in women over androgenic alopecia since the role of androgens in women is not still clear [1].

FPHL pathophysiology is not well understood yet, and it is likely to be a multifactorial genetic trait. Androgen-independent mechanisms may contribute to this phenotype in addition to androgen-dependent ones. FPHL is also seen in women without elevated androgen levels, raising the likelihood of interference of androgen-dependent mechanisms, and explaining the lack of response to treatment with androgen inhibitors in some FPHL patients [2].

Vitamin D optimum level is crucial to postpone aging phenomena, comprising hair loss. Thus, serum Vitamin D levels are a factor recently taken into consideration in approaching patients with loss of hair [1].

It was suggested that women suffering from FPHL should be studied to decide whether there is a connection between hair loss and altered serum 25 (OH) D concentrations [3].

2. PATIENTS AND METHODS

This study was a comparative study included 45 patients with female pattern hair loss (FPHL). It was carried out during the period from May 2018 to May 2019 at Dermatology & Venereology and Medical biochemistry departments, faculty of medicine, Tanta University.

2.1 Patients Group

This group included 45 patients with female pattern hair loss. The patients were selected from the outpatient clinics of Dermatology and Venereology Department, Tanta university hospital. They were diagnosed clinically and by the dermoscope according to criteria of diagnosis of FPHL [4].

2.2 Inclusion Criteria

Newly diagnosed FPHL patients, patients not receiving any topical or systemic treatment for the last 6 months.

2.3 Exclusion Criteria

Pregnant and lactating females, patients who have any other dermatologic or systemic disease that may affect the results e.g. (multiple sclerosis, psoriasis, Osteoarthritis, and chronic kidney disease), patients who received minoxidil or vitamin D before study and patients with abnormal blood pressure.

2.4 Measurement of Serum Vitamin D

2.4.1. Biochemical analysis

Determination of 25-OH Vitamin D: Total 25-OH Vitamin D was determined according to the enzymatic immunoassay method using a Kit obtained from (Chemux bioscience, Inc.). Principal: The 25-OH Vitamin D quantitative test kit is based on a solid phase enzyme-linked immunoassay (ELISA).

2.5 Statistical Analysis

In the present study, statistical analyses of data were carried out using SPSS version 23. The probability (P) values of ≤0.05 were considered statistically significant indicated, while P> 0.05 was considered statistically not significant and indicated NS.

3. RESULTS

The age of patients ranged from 17.0 – 58.0, with a mean 34.13 ± 11.66, mean of duration is 3.31 ± 2.13, 34% had family history (Table 1).

As regard serum vitamin D, Mean ± SD was 18.0 ± 11.97, (Table 2).

Mean ± SD. of yellow dots was 2.80 ± 4.48, Mean ± SD of thin hair was 23.56 ± 7.81, Mean ± SD. of single hair unit 27.56 ± 10.37 (Table 3).

There was no significant correlation between vitamin D level and these parameters (Table 4).

4. DISCUSSION

This study included 45 patients with female pattern hair loss. As regard serum vitamin D, mean ± SD was18.0 ± 11.97, the work by Hagag et al., [5] who found that the mean serum vitamin D level among patients was statistically significantly lower than control group. Moreover, other studies reported that mean vitamin D levels were reduced in many patients with FPHL [1]. In

addition, Fawzi et al., [6] reported significantly decreased concentrations of both serum and tissue VDR in androgenic alopecia in comparison with healthy controls. No correlation was observed between serum or tissue VDR concentration and disease severity.

Table 1. Demographic data of the patient groups

	Total (n= 45)		
	Min. – Max.	**Mean ± SD.**	**Median (IQR)**
Age (years)	17.0 – 58.0	34.13 ± 11.66	31.0(23.5 – 43.5)
Duration (years)	1.0 – 10.0	3.31 ± 2.13	3.0(2.0 – 5.0)
BMI (kg/m^2)	21.13 – 39.32	29.73 ± 5.03	30.85(25.6 – 32.5)
	no.	**%**	
Medical history			
No	33	73.3	
Thyroid (hypo)	2	4.4	
Thyroid (hyper)	1	2.2	
Diabetes	9	20	
Hirsutism	20	44.4	
Acne	10	22.2	
Menstrual irregulities	14	31.1	
Family history	34	75.6	
Menopause			
No	40	88.9	
Yes	5	11.1	
Ludwig grade			
0	0	0	
I	13	28.9	
II	32	71.1	

Table 2. vitamin D level in the studied cases

Vitamin D	**Patient (n = 45)**
Min. – Max.	6.90 –70.90
Mean ± SD.	18.0 ±11.97
Median (IQR)	14.70(11.3 –61.6)

Table 3. Dermoscopic signs of FPHL

	No.	**%**
Perifollicular pigmentation		
Absent	39	86.7
Present	6	13.3
Yellow dots		
Min. – Max.	0.0 – 16.0	
Mean ± SD.	2.80 ± 4.48	
Median (IQR)	0.0(0.0 – 7.0)	
Thin hairs (%)		
Min. – Max.	10.0 – 40.0	
Mean ± SD.	23.56 ± 7.81	
Median (IQR)	25.0(15.0 – 30.0)	
Single hair unit (%)		
Min. – Max.	10.0 – 50.0	
Mean ± SD.	27.56 ± 10.37	
Median (IQR)	30.0(20.0 – 40.0)	

Table 4. Correlation between Vitamin D level, Ludwig's grade and other dermoscopic findings

	Vitamin D	
	r	**P**
Ludwig grade	0.189	0.316
Perifollicular pigmentation	0.253	0.177
Yellow dots	0.219	0.246
Thin hairs	0.167	0.376
Single hair unit	0.058	0.761

r: Pearson coefficient

In contrary two studies discovered the lack of difference between Vitamin D levels and androgenic alopecia in men as they suggested that vitamin D deficiency is supposed to be incriminated in the development of FPHL through androgen-independent mechanisms [7].

Ganjoo and Thappa, [8] similarly demonstrated that yellow dots responded last in their study of alopecia areata. This could be explained by the nature of skin type III in Egypt that allow easy perception of yellow dots. As dark skin types make yellow dots are more obvious.

Up to now, there are no studies evaluating the oral supplementation of vitamin D in patients with FPHL and this is mentioned in other literatures [9].

Nevertheless, supporting our assumption that vitamin D therapy may be beneficial in FPHL, there was an observable recovery of alopecia areata with reduced vitamin D receptor expression after topical application of calcipotriol, a strong vitamin D analog, after failure of response to various treatments [10].

Limited studies have been done in humans to elaborate the role of vitamin D in the hair cycle. A potential application for vitamin D is in chemotherapy-induced alopecia. Topical calcitriol has been shown to protect against chemotherapy-induced alopecia caused by paclitaxel and cyclophosphamide [11]. Of note, the studies in which no effects were observed, were small and may have used doses of vitamin D that were inadequate to protect against chemotherapy-induced alopecia [12].

The exact mechanism of the additive effect of vitamin D therapy in FPHL is still unknown, but there were many suggested mechanisms by which vitamin D might have a possible influence on hair follicle cycling and growth.

It was found that vitamin D regulates hair follicle cycles so a shorter life span of hair follicles is associated with its deficiency [1].

It was proposed that vitamin D participates in hair follicle cycling. In vitro investigations have shown increase in vitamin D receptor (VDR) expression in the outer root sheath (ORS) and keratinocytes throughout the growing phases of the hair cycle [5]. It was suggested that vitamin D receptors directly or indirectly might regulate the expression of genes required for hair follicle cycling [13]. It was found that both the vitamin D receptor (VDR) and hairless (hr) genes play a role in the mammalian hair cycle, as inactivating mutations in either result in total alopecia [14].

In vitro studies showed that VDR plays a vital role in preserving the hair follicles after birth. Mesodermal papillary cells and keratinocytes of outer root sheath epidermis express varying levels of VDR based on the stage of the hair cycle. In terminal anagen and catagen stages, VDR is increased and is associated with decreased proliferation and increased differentiation of keratinocytes. These changes seem to stimulate the growth of hair cycle [11]. Therefore, it has been proposed that VDR is required for anagen initiation [15].

Nashold et al., [16] studied the interplay between the female hormones and vitamin D in and demonstrated a synergistic mechanism between them. They reported that 1, 25-(OH) 2D3 stimulates estradiol (E2) synthesis by VDR-mediated up-regulation of E2 synthase, while E2 stimulates synthesis and function of 1, 25(OH) 2D3 by estrogen receptor-mediated down-regulation of CYP24A1 gene, resulting in accumulation of 1, 25 (OH) 2D3 and up-regulation of VDR. These findings could partially explain the higher VDR expression in female AGA patients.

Furthermore, a cross sectional study revealed that the severity and extent of the baldness did

not appear to be associated with serum 25-hydroxyvitamin D levels. This raises the speculation about the real value of vitamin D levels in hair loss, and whether the story could be intrinsic, closely related to the receptor itself rather than to the level of vitamin D [17].

In this study, correlation between vitamin D and Ludwig grading and other dermatological signs of FPHL revealed no significant correlation between vitamin D level and these parameters. This may be explained by the fact that no severe cases with grade III Ludwig's were present in this study. Longer duration may be needed; injection may be more beneficial and may be to poor compliance of patients to therapy.

Contrary to this, Rasheed et al., [18] found that patients with mild and moderate FPHL had significantly higher mean serum levels of 25(OH) D compared to those suffering from the severe form. It cannot be excluded that conflicting results observed in both studies were determined by different patterns of sun exposure and evaluation of serum 25 (OH) D levels in different parts of the year.

In contradiction with these findings, Hagag et al. [5] found a significant negative correlation between differential serum level of vitamin D and grade of hair loss. Moneib et al. [3] revealed no significant difference between patients with different Ludwig's degrees regarding sufficient vitamin D levels; however, a significant difference was found between them regarding insufficiency and deficiency of vitamin D.

5. CONCLUSION

According to this study, the risk of FPHL was associated with decreased serum levels of Vitamin D3, and it is recommended to evaluate serum D3 level along with other hormone assays to check the patient's status. It is also suggested to evaluate the therapeutic effects of oral Vitamin D3 supplements and topical compounds such as calcipotriol in the treatment of FPHL. The limitation of this study was lack of a standard to assess diet in patients to match the control and patient groups in terms of the level of dietary D3 intake.

CONSENT

An informed consent was taken from each individual participated in the present study and all were fully informed concerning the nature of the disease and the diagnostic procedures. The expected risk that may be appeared during the course of research was cleared to the participants and to the ethical committee on time and the participation in the study was voluntary**.**

ETHICAL APPROVAL

This study was approved by the Research Ethical Committee in Faculty of Medicine, Tanta University (Code No.32077/01I18).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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