

SERUM VITAMIN D3 LEVELS IN PATIENTS WITH TELOGEN EFFLUVIUM IN DUHOK GOVERNORATE

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Submitted 11th July 2022; accepted 19th September 2022

ABSTRACT

Background: Telogen effluvium, a commonly reported problem, strictly affect the quality of life of the patients. Vitamin D stimulates differentiation of hair follicles. The association between serum vitamin D levels and telogen effluvium describe in several studies. The aim of study was to determine serum level of vitamin D in patients with telogen effluvium and analyze the relationship of altered serum total vitamin D levels with Telogen effluvium.

Methods: This study was conducted at dermatological department out-patient clinic of Azadi Teaching Hospital, Duhok city, Kurdistan Region-Iraq, during period from 20th of December 2021 to 20th of April 2022; in which 100 subjects included 50 cases with telogen effluvium and 50 healthy controls.

Results: The prevalence rate of vitamin D deficiency among patients with telogen effluvium was distributed as severe deficient 62%, insufficient 26%, and sufficient 12%. Mean \pm SD of vitamin D was 6.93 ± 3.56 for patients compared with Mean \pm SD 21.10 ± 11.88 , (p-value <0.0001) for healthy control. Most cases were from urban areas and most controls were from rural areas, 66% versus 55.01 % (p=0.0346).

Conclusions: The patients with telogen effluvium in this study had significantly low levels of serum total vitamin D and higher prevalence rate of vitamin D deficiency when compared with healthy control.

Duhok Med J 2023; 17 (1): 39-50.

Keywords: Non-scarring hair loss, Serum vitamin D, Telogen effluvium.

Telogen effluvium is a reversible non-scarring type of hair loss, shedding of the hair occur after two to three months of initiating event¹. Diffuse hair loss is due to the disturbance of any hair cycle phase: anagen (phase of active growth), catagen (involution phase), or telogen (the stage of resting). Loss of hair Which is rapid in onset and diffusive in nature with decrease of the entire hair bulk². Acute onset less than six months duration named as acute telogen effluvium, while a longer duration more than six months called

chronic telogen effluvium³.

Vitamin D is considered as one of the fat-soluble vitamin that synthesized by the human skin after sun exposure. Therefore, it is also known as "Sunshine Vitamin"⁴. Although vitamin D can produce adequately by skin, deficiency of vitamin D can prevent with solar exposure as little as 15 minutes per 24 hour, while this period differs according to season, area, cloud cover, time of day, coverage clothing, use of sunscreen, and pigmentation of skin⁵. Dietary intake come

<https://doi.org/10.31386/dmj.2023.17.1.4>

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to be the further essential source of vitamin D6. Naturally Vitamin D is available in modest quantities in egg yolks and fatty fish and in lesser quantities in other foods⁷. Vitamin D shows an important role in the differentiation of keratinocytes and proliferation of new hair follicles and skin cells. Studies and researchers have supposed that vitamin D receptors may have an important role in maintenance of the hair follicle postnatal⁸. There is growing evidence of the relationship between vitamin D levels and telogen effluvium. The aim of our study was to determine the levels of total serum Vitamin D in patient with telogen effluvium.

MATERIALS & METHODS

Subjects and study design

This case-control study was conducted at dermatological department out-patient clinic of Azadi Teaching Hospital in Duhok city/Kurdistan Region-Iraq, during period from 20th of December 2021 to 10th of April 2022 .The study was carried out on 100 subjects divided into 2 groups during a period of 6 months: First group, 50 patients with telogen effluvium (TE). Second group, 50 healthy subjects without Telogen effluvium hair loss. This study was approved by the Ethics Committee of the Directorate of Health of Duhok and the Scientific Committee of the College of Medicine of Duhok University, reference number (10112021-11-10).

Patients were excluded from this study if they had any dermatological conditions of scalp and any type of hair loss other than telogen effluvium ,family and personal history of thyroid diseases, serum zinc deficiency, iron deficiency anemia, chronic

hematological disease, known hepatic or renal disease, pregnancy, lactation, Post febrile (extremely high fevers. Severe infection, Postsurgical (implies major surgical procedure), starvation/malnutrition or on supplement containing vitamin D, zinc and iron for the last 6 months were also excluded. Written informed agreement from the participants has been obtained.

Data collection

A special questionnaire has been proposed to gather data from participants case and control base on gender, age, educational level, job, marital status, socioeconomic status, education levels, BMI, type of hair loss, personal history of similar or other diseases, family history of chronic condition, drug history ,alcohol and smoking .

Assessment of study variables

1. Body Mass Index (BMI): was calculated via dividing weight in kilogram (kg) over squared height in meter (m²)⁹.

$$\text{BMI} = \text{weight (kg)} / \text{Height (m}^2\text{)}$$

According to the National Institute of Health, the Body Mass Index was defined as follows¹⁰:

Underweight	<18.5 Kg / m ²
Normal weight	18.5-24.9 Kg / m ²
Overweight	25-29.9 Kg / m ²
Obese	> 30 Kg / m ²

2. Assessment of total vitamin D levels: An Assessment of 25 (OH) D status was done according to the following criteria¹¹:

Vitamin D severe deficiency is defined as <10 ng/ml (< 25 nmol/L)

Vitamin D insufficiency 10-29.9ng/ml (25-74.9 nmol/L)

Vitamin D sufficiency 30-150ng/ml (75-375nmol/L)

Vitamin D toxicity $\geq 150\text{ng/ml}$ ($\geq 375\text{nmol/L}$)

Methodology

After written informed agreement from the participants has been obtained, diagnosis of telogen effluvium done by hair pull test and dermoscopic examination, blood sample were collected from participants who met inclusion criteria of our study for sera blood, samples were collected in BD vacutest plain tube (8ml), by using medical centrifuge at 3000 rpm (revolution per minute), the serum separated for 10 minutes and then the serum had been send for analysis of serum total vitamin D.

Serum level of vitamin D was measured via clinical chemistry analyzer cobas 6000 analyzer.

STATISTICAL ANALYSES

The general information of the patients and healthy controls were presented in mean (SD) or number (%). The level and prevalence of vitamin D were determined in mean (SD) and number (%), respectively. The comparisons of general characteristics between patients with Telogen effluvium and healthy controls were examined in an independent t-test or Pearson chi-squared tests. The significant level of difference was determined by a p-value of less than 0.05. The statistical calculations were performed in JMP Pro14.3.0.

RESULTS

A total of 100 subjects participated in this study, divided into two groups first group in the study included 50 patients with

telogen Effluvium and second group include 50 apparently healthy controls without telogen effluvium. The patients were distributed according to the duration of illness as follows: less than 6 months in 9 (18%) and more than or equal to 6 months in 41 (82%) (Figure1).

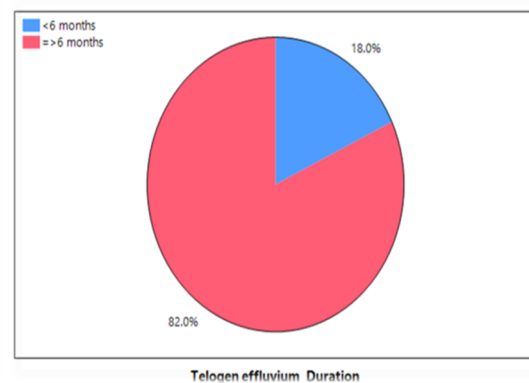


Figure 1: Duration of disease in patients with Telogen effluvium

Comparisons of general characteristics of the participants shown in Table 1. With respect to age category, gender, education level, Job, social status, BMI and smoking, no significant differences were found. Regarding residence, most cases were from urban areas 66%, and most controls were from rural areas 55.01%, $p=0.0346$. Marital state show significant differences between patients with telogen effluvium. Most cases were single and most healthy control were married 56%, V.S 66%, $p=0.0270$.

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Table1: Comparisons of general characteristics of the participants

Characteristics	Study groups no (%)		p-value (two-sided)
	Case (n=50)	Control (n=50)	
Age mean (SD)	29.8 (10.3)	34.0 (13.3)	0.0873a
Age category			
13-19	7 (14.0)	6 (12.0)	0.5513b
20-29	19 (38.0)	17 (34.0)	
30-39	15 (30.0)	13 (26.0)	
40-79	9 (18.0)	14 (28.0)	
Gender			
Male	17 (34.0)	13 (26.0)	0.3827b
Female	33 (66.0)	37 (74.0)	
Residence			
Rural	17 (34.0)	27 (55.1)	0.0346b
Urban	33 (66.0)	22 (44.9)	
Marital state			
Married	22 (44.0)	33 (66.0)	0.0270b
Single	28 (56.0)	17 (34.0)	
Education			
Illiterate	5 (10.0)	7 (14.0)	0.0945b
Primary	5 (10.0)	1 (2.0)	
Intermediate-secondary	16 (32.0)	9 (18.0)	
University	24 (48.0)	33 (66.0)	
Job			
Employed	13 (26.0)	26 (52.0)	0.0621b
Housewife	17 (34.0)	12 (24.0)	
Student	13 (26.0)	7 (14.0)	
Workers	7 (14.0)	5 (10.0)	
Social status			
Low	22 (44.0)	21 (42.0)	0.3551b
Medium	23 (46.0)	19 (38.0)	
High	5 (10.0)	10 (20.0)	
BMI category			
Underweight	3 (6.0)	1 (2.0)	0.7710b
Normal weight	19 (38.0)	19 (38.0)	
Overweight	15 (30.0)	17 (34.0)	
Obese	13 (26.0)	13 (26.0)	
Smoke			
No	36 (72.0)	43 (86.0)	0.0857b
Yes	14 (28.0)	7 (14.0)	

a an independent t-test and b Pearson chi-squared tests were performed for statistical analyses.

The red bold numbers show the significant differences.

The mean (SD) of Vitamin D in patients with telogen effluvium and apparently healthy controls without telogen effluvium are presented in Table 2. Significantly, low Vitamin D levels were observed in patients

compared with healthy controls without telogen effluvium 6.93 for case compared to 21.10 for control ($p < 0.0001$). Total serum vitamin D in patients with telogen effluvium shows Sever deficient 62%,

insufficient 26%, and sufficient 12% while levels show Sever deficient 18% in healthy controls serum total vitamin D insufficient 62% and sufficient 20%.

Table 2: Comparisons of vitamin D levels (mean (SD) and prevalence) between patients with Telogen effluvium and healthy controls

	Study groups		p-value (two-sided)
	Case (n=50)	Control (n=50)	
Vitamin D mean (SD)	6.93 (3.56)	21.10 (11.88)	<0.0001a
Vitamin D3 level no (%)			<0.0001b
Severe deficient	31 (62.00)	9 (18.00)	
Insufficient	13 (26.00)	31 (62.00)	
Sufficient	6 (12.00)	10 (20.00)	

a an independent t-test and b Pearson chi-squared tests were performed for statistical analyses.

The red bold numbers show the significant differences.

Table 3 shows total serum vitamin D level in subjects according to ages and gender, BMI, and residence. The mean values of vitamin D was increased from young ages to middle (P<0.0001) which is statistically significant, Age from 13-19 mean was 6.45 while age from 20-29 mean 8.26 and 30-39 mean 12.56. While the mean values and prevalence of vitamin D was

statistically significant in term of residence in patients (P= 0.0126), mean value for rural area was 5.81 while for urban area was 13.05. The mean values and prevalence of vitamin D was not statistically significant between male and female (P = 0.0985) and BMI (P = 0.0898) in cases.

Table 3: vitamin D levels in cases of different ages and gender, BMI and residency.

	Case				p-value (two-sided)
	Mean (SD)	Vitamin D deficiency no (%)			
	Vitamin D	Severe deficient	Insufficient	Sufficient	
Age category					
13-19	6.45 (2.50)	6 (85.71)	0 (0.00)	1 (14.29)	
20-29	8.26 (4.56)	13 (68.42)	4 (21.05)	2 (10.53)	<0.0001a
30-39	12.56 (11.94)	9 (60.00)	4 (26.67)	2 (13.33)	0.0976b
40-49	9.0 (2.85)	2 (40.00)	3 (60.00)	0 (0.00)	
50-59	13.11 (9.56)	1 (33.33)	2 (66.67)	0 (0.00)	
70-79	62.22 (.	0 (0.00)	0 (0.00)	1 (100.00)	
Gender					
Male	8.57 (4.57)	11 (64.71)	5 (29.41)	1 (5.88)	0.0985c
Female	6.41 (3.45)	20 (60.61)	8 (24.24)	5 (15.15)	0.6222b
BMI					
Underweight	17.19 (15.64)	1 (33.33)	1 (33.33)	1 (33.33)	0.0898a
Normal weight	6.47 (2.81)	16 (84.21)	1 (5.26)	2 (10.53)	0.1134b
Overweight	11.77 (9.57)	9 (60.00)	5 (33.33)	1 (6.67)	
Obese	12.29 (9.68)	5 (38.46)	6 (46.15)	2 (15.38)	
Residency					
Rural	5.81 (2.97)	13 (76.47)	3 (17.65)	1 (5.88)	0.0126c
Urban	13.05 (10.53)	18 (54.55)	10 (30.30)	5 (15.15)	0.3066b

DISCUSSION

Vitamin D is one of the fat-soluble vitamins synthesized by the skin after solar exposure. Deficiency of vitamin D is common in many developed countries; the prevalence of vitamin D severe deficiency and insufficiency have been described in several studies covering all areas^{12,13,14}, mostly related to less consumption of foods that are rich in vitamin D like milk, fatty fish, and nutritional supplements as well as less exposure to sunlight which initiates vitamin D synthesis in the human body¹⁵.

Telogen effluvium (TE) is defined as shedding of hair after 2–3 months of triggering event, Vitamin D deficiency state is also described in some type of non-scarring of hair loss like telogen effluvium, alopecia areata, androgenetic alopecia and trichotillomania^{16,17}. In telogen effluvium, vitamin D affects the hair cycle through bind to the vitamin D receptor (VDR) which control and regulates keratinocytes differentiation and hair growth, viewing their maximum activity in the anagen phase^{16,18}.

In the present study, an attempt was done to assess the serum levels of vitamin D in patients with telogen effluvium and explain its relation with vitamin D levels. The current study reported that there was significant difference in serum vitamin D levels between patients and controls, the mean (SD) of Vitamin D in patients with telogen effluvium and controls was (6.93 (3.56), 21.10 (11.88), p-value <0.0001) respectively, which is statistically significant. Compared with other studies, our study are in agreement with previous studies^{19,20,21}. our result agreed with study done in Saudi Arabia by Mohammed,

Salma S. et al that showed the mean of vitamin D in patients was considerably lesser than controls ($P < 0.001$), with Mean \pm SD of vitamin D among cases 13.36 ± 9.56 ,²². Also, NAYAK, Kashinath, et al conducted a case-control study in a city in South India from June and August 2015 and have similar to our result²³.

Our results disagreed with Karadag et al study done in Turkey, which detected that vitamin D in patients with telogen effluvium was higher than control, Mean \pm SD of acute TE; 18.5 ± 9.2 , CTE; 24.4 ± 11.2 , $P < 0.01$), and our results disagree with Narges et al study done in Iran they found that the frequency of suboptimal levels of ferritin, 25OH vitamin D, and zinc was not significantly different between two studies groups^{24,25}.

In our study, It was significant that the majority of the patients had severe deficiency of serum total vitamin D (62%), while insufficient levels of serum total vitamin D reached (26%) and sufficient level was (12%) in comparison with other studies done in Saudia Arabia, deficiency of vitamin D among cases 89% related to 33% of the healthy controls²².

The high prevalence rate of deficiency and low level of vitamin D in the current study may be due to various factors, mainly low vitamin D rich food intake, seasonal variants and geographical position which disturb production of vitamin D. During winter, individuals have less exposure to sun, and during summer the sun is straight overhead so the peoples avoid sun exposures, Thus, low vitamin D is significant health problem in Iraq²⁶. NAYAK, Kashinath, et al suggested that these results varied between the cases and controls related to solar exposure, use of

sunscreen, and clothing type²³. While Karadag et al and Narges, et al, They suggested that no synthesis of melanin by telogen hairs, these results in additional ultraviolet rays exposure in scalp and further vitamin D synthesis, but their outcomes may due to small sample size^{24,25}.

In our study, It has observed that the mean values of vitamin D among cases were increased from young ages to middle and old ages ($P < 0.0001$). which is statistically significant. The mean values and prevalence of vitamin D was not statistically significant among gender in cases and controls. These results agreed with study done in Iran by Khazaei, Zaher, et al, which studied the association between the level of vitamin D with gender and age groups (the young, adult and elderly). the results displayed, that the level of vitamin D had no association with gender but For age groups, there is a significant association between serum vitamin D and age ($P = 0.02$); old participants had a greater level of serum total vitamin D²⁸. This result mainly due to more sunlight exposure by elderly people, and increased dietary rich vitamin D intake.

Our results disagreed with study done in Canada Among the 404 participants who were not on vitamin D supplements, there was insignificant association between serum vitamin D and age, ($P > 0.4$)²⁹.

There was significant difference between patient and control in terms of residency ($P = 0.0346$), the mean (SD) of Vitamin D in patients with telogen effluvium (5.81 (2.97) for Rural areas and 13.05 (10.53) for Urban areas, p -value < 0.0126 , which is statistically significant. Sever

Deficiency of vitamin D was more common in rural area than in urban (76.47% vs 54.55%). Our study done during winter and spring time, we targeted individuals with similar characteristics to well recognize the effects of residency on vitamin D levels. This result may be due to clothing style, in rural areas, traditional dress permitting less solar exposure to the skin. Also During winter, individuals have less exposure to sun; length of the day was short, and cloud cover. Our results agree with study done in Al- Hilla City, Babylon province, Iraq and show that (56%) of the participants live in urban areas³⁰.

Marital status shows significant differences between the case (56% single while 44% married) and control (34% single with 66% married), $p = 0.270$. This could be due to the single take more care seeking treatment for hair loss using sunscreen, lifestyle, and nutritional habits. Our result in contrast with the cross-sectional study done by Gaafar, M., & Badr, S et al in the State of Kuwait and shows insignificant relationship between vitamin D and marital status ($p > 0.05$)³¹.

CONCLUSIONS:

Significantly low levels of serum total vitamin D has seen in patients with telogen effluvium, severe deficient 62%, insufficient 26%, and sufficient 12% with higher prevalence rate of vitamin D deficiency when compared with control.

Recommendations:

Our study recommend a study on effect of vitamin D supplement in low vitamin D among TE patients.

ACKNOWLEDGEMENTS

I wish to extend my special thanks to Dr. Barzan Khalid Sharaf and all my colleagues and the staff of Dermatology Department and the laboratory department of Azadi Teaching Hospital, Duhok for their help and support.

CONFLICT OF INTEREST

No conflict of interest.

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پوخته

ناستی فیتامین د له سیرۆمدا له نهخۆشی ین تووشبوو به تیلۆجین ئیفلۆقیۆم له پارێزگای دهۆک

پێشەکی: تیلۆجین ئیفلۆقیۆم نهخۆشییهکی زۆر باو و ئاساییه، ئەم جۆره له هەلمۆرینی قژ بەزۆری ترسناک نییه، هەروەها هەلمۆرینی قژ دوو بۆ سێ مانگ دواى دەستپێکردنی رووداوێکە روودادات. بەلگەی پەرەسەندن هەیه لەسەر پەيوەندی نێوان ناستی فیتامین (د) و ئیفلۆقیۆمی تیلۆجین. نامانج له توێژینهوهکهمان دیاریکردنی ناستی فیتامین د له سیرۆمی خوینی ئەو نهخۆشانهی که تووشی تیلۆجین ئیفلۆقیۆم، هەروەها شیکردنهوهی پەيوەندی نێوان ناستی فیتامین (د) و تیلۆجین ئیفلۆقیۆم.

کەرەسته و رێک: ئەم توێژینهوهیه وهک کۆنترۆلی کهیس بۆ ئەو نهخۆشانه دارێژراوه که گلەیی له دەرچوونی تیلۆجین دهکەن، که سەردانی کلینیکی دەرەوهی بەشی پێست له نهخۆشخانهی فێرکاری نازادی له شاری دهۆک/هەریمی کوردستانی عێراق دهکەن. توێژینهوهکه لەسەر 100 کەس ئەنجامدراوه که دابەشکراون بەسەر دوو گروپدا 50 نهخۆش که له پشکنینی قژ-کێشادا تووشی ئیفلۆقیۆمی تیلۆجین بوون لهگەڵ پشکنینی کلینیکی و 50 کۆنترۆلی تەندروست بهبێ ئیفلۆقیۆمی تیلۆجین، و ناستی فیتامین (د) له سیرۆمدا پێوانه کرا.

ئەنجام: بڵاوبونهوهی کهمی فیتامین (د) له نێوان ئەو نهخۆشانهی که تیلۆجین ئیفلۆقیۆمیان ههههوه هیندهی 62% توند بوو، له 26% دا بهس نهبوو، و له 12% دا بهس بوو. مامناوهندی \pm لادانیکى ستاندارد بۆ فیتامین (د) $(6.93 \pm)$ 3.56 بوو، $p < 0.0001$ بۆ نهخۆشەکان به بهراورد لهگەڵ مامناوهندی \pm لادان بۆ کۆنترۆلی تەندروست. $(21.10 \pm 11.88, p < 0.0001)$

دەرئەنجام: ئەو نهخۆشانهی که تیلۆجین ئیفلۆقیۆمیان ههههوه لهم توێژینهوهیهدا ناستی کۆی فیتامین (د) له سیرۆمدا به شێوهیهکی بهرچاو کهمتر بووه و بڵاوبونهوهی کهمی فیتامین (د) یان بهرزتر بووه به بهراورد به کۆنترۆلی تەندروست.

الخلاصة

مستويات فيتامين د في مصل الدم لدى المرضى الذين يعانون من تساقط الشعر الكربي في محافظة دهوك

الخلفية والأهداف: تساقط الشعر الكربي هو مرض شائع جداً وعادة ما يكون هذا النوع من تساقط الشعر غير مخيف، ويحدث تساقط الشعر بعد شهرين إلى ثلاثة أشهر من بدء الحدث. هناك أدلة متزايدة على العلاقة بين مستويات فيتامين (د) وتساقط الشعر الكربي. ان الهدف من دراستنا هو تحديد مستويات فيتامين (د) في مصل الدم لدى المرضى المصابين بتساقط الشعر الكربي، وتحليل العلاقة بين مستويات فيتامين (د) وتساقط الشعر الكربي.

المواد والطرق: صُممت هذه الدراسة باعتبارها حالة ضابطة للمرضى الذين يشكون من تساقط الشعر الكربي، الذين يزورون العيادة الخارجية لقسم الأمراض الجلدية في مستشفى آزادي التعليمي في مدينة دهوك/ إقليم كردستان العراق. أجريت الدراسة على 100 شخص مقسمين إلى مجموعتين 50 مريضاً بتشخيص تساقط الشعر الكربي على اختبار شد الشعر بالإضافة إلى الفحص السريري و 50 عنصر تحكم سليم بدون تساقط الكربي ، وتم قياس مستويات فيتامين د في مصل الدم.

النتائج: كان معدل انتشار نقص فيتامين (د) بين المرضى الذين يعانون من تساقط الشعر الكربي يتوزع كالتالي نقص حاد بنسبة 62%، وغير كافٍ بنسبة 26%، وكافٍ بنسبة 12%. كان المتوسط \pm الانحراف المعياري ل فيتامين د (6.93 ± 3.56) ، $p < 0,0001$ للمرضى مقارنة المتوسط \pm الانحراف للتحكم الصحي. $(21.10 \pm 11.88 ، p < 0.0001)$

الاستنتاجات: كان لدى المرضى المصابين بتساقط الشعر الكربي في هذه الدراسة مستويات منخفضة بشكل ملحوظ من فيتامين (د) الكلي في الدم ومعدل انتشار أعلى لنقص فيتامين (د) مقارنة بالسيطرة الصحية.