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Serum Vitamin D3 Level in Association with Chronic Telogen Effluvium in Adult Females

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Original Article

ABSTRACT

Background: *Chronic Telogen Effluvium (CTE), is one of the challenges in hair loss pathogenesis and treatment globally. In the last 10 years vitamin D3 take a great part in the new researches, including dermatological diseases especially hair loss.* ***Objective:*** *To evaluate the relationship between the serum level of vitamin D3 and chronic telogen effluvium in women:* ***Methods:*** *A prospective case control study, included 31 women with hair loss as cases, and 31 women without hair loss as control group, aged 18-39 years, in Salah-Al-Deen province in Iraq.* ***Results:*** *The mean vitamin D3 level of cases was (9.78 ± 6.518) compared to (16.74.± 6.99) among controls. Deficiency of D3 was more prevalent among cases contributed for (48%) while in control group was (42%) with no statically significant association (OR=5.769 (0.633-19.55)), (p=0.086).* ***Conclusion:*** *Serum vitamin D3 level in females is generally low. No significant association between vitamin D3 level and chronic telogen effluvium.*

Keywords: *Chronic Telogen Effluvium , Hair loss, Vitamin D3, Androgenic Alopecia, Female pattern hair loss*

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1. INTRODUCTION

Normally scalp hair contains approximately 90% of the follicles in the anagen phase, and the (5–15%) will be in the telogen phase. There are only a few follicles in the catagen phase. 50–150 hairs are the normal daily loss. Human hair grows variably for a few months to years before it becomes a telogen hair and is shed. Anagen phase of the hair of scalp is longer than all parts of body hairs. [1,2]

Telogen effluvium: Shedding of resting or telogen hair, presents a diffuse, non-patterned increase in shedding of terminal hairs, over the entire scalp, with sometimes an apparent thinning of hair of variable severity. It may be either acute or chronic. [1,2] Whatever the cause of the hair loss, the follicle behaves in a similar way, and the follicle is precipitated into catagen and transforms into a resting stage that mimics telogen, leading to premature anagen. [2]

Clinical features

A short-lived insult usually produces a sudden-onset diffuse shedding 6–12 weeks later. If the insult is prolonged or repeated, shedding can develop insidiously. Chronic diffuse telogen hair loss refers to telogen hair shedding persisting for longer than 6 months. It can be a result of an idiopathic change in hair cycle dynamics (primary chronic telogen effluvium) or be secondary to a variety of causes including female pattern hair loss. [2] (CTE) is a common, diffuse hair loss that affects the entire scalp, with no obvious cause can be found. Usually, it affects women of age 30 to 60 years. Women of thick hair usually notice it more than those of finer hair. They described their previous hair to be thicker and longer than recent reflecting a previous long anagen phase, with abrupt, continuous or fluctuating loss. Usually, they bring balls of their fallen hair to the doctor, and are afraid of getting baldness. There is usually a gradual onset, with or without a recognizable initiating factor, or be initiated by an acute telogen effluvium. Hair shedding often is severe in early stages, that the hair could come out in handfuls. [3]

Histological and clinical features of (CTE) are distinctive and diagnostic usually. It contrasts to acute telogen effluvium (ATE) it differs by its chronicity and fluctuation for years. Patients (women) are particularly frightened by the continuing hair loss and fear of total scalp baldness. Reassurance is mandatory explaining that the state is a shedding of hair, rather than hair loss actually, and does not cause complete baldness. (CTE) may be

considered to be self-limiting in its course. All of those complaining of (CTE) don't get complete baldness, but hair thinning may reveal and unmask genetic tendency of female or male pattern hair loss. Bi-temporal recession of variable severity may be seen, but differ in that it is without widening of the central part, like it in androgenic alopecia. Hair pull test is done and show positive over the vertex and the occipital scalp. If negative pull test, do it again in the subsequent visits. Biopsy, -if needed- should be obtained at the level of sebaceous gland (4mm). Normal terminal to miniaturized hair ratio is 7:1, while a ratio > 8:1 is considered a diagnostic of CTE. [4, 5]

Androgenic Alopecia

It's the most common form of human hair loss. It is a non-scarring hair loss that is under the control and the influence of androgens (di-hydro-testosterone, DHT), and the androgen susceptibility of the hair follicles plays an important role in this. Clinical characteristics include a reduction of terminal hair density on the scalp that follows a typical pattern in both genders, with a conversion of terminal to villus-like hairs and an increase of telogen hair (in an episode of active shedding).

Classification with gender-specific features (Norwood–Hamilton classification for men and Ludwig classification in women) could undergo with a wide clinical overlap. [6]

Female pattern hair loss (FPHL): A classification for pattern of androgenic alopecia (AGA) in women, was introduced by Ludwig in 1977, characterized by a diffuse loss of hair on the crown and persistence of the frontal hairline, Ludwig scale became a scale for grading FPHL as well as Sinclair scale which in 2004. Olsen noted in 1994 that women with AGA may have increased hair loss towards the front, called frontal accentuation or Christmas tree pattern, and did not necessarily present with diffuse hair loss over the entire top. [7] Also, women may show a male pattern of distribution, as well as men can show a more female pattern. Standardized global scalp photography is very helpful as a qualitative assessment of the progression of the hair loss and as therapy control. [7,8]

In women, a laboratory test for ferritin and thyroid-stimulating hormone (TSH) are recommended to roll out underlying causes of hair loss. An extensive laboratory workup for androgens is not recommended for a routine visit. Women with irregular periods and/or other signs of androgen excess should be at least checked for free and total testosterone as well as dihydroepiandrosterone-sulphate DHEA-S. [9] A pull test and a trichogram can give

information on the ongoing activity of the condition. The pull test should be used first in any patient complaining of hair loss and indicates the severity of the disorder. The procedure consists in dipping the fingers into the scalp hair, in four different areas, and in counting the hairs that remain entrapped. Normally, only telogen hairs are shed and, in the adults, their number does not exceed four to five for the whole scalp. The hair number and the morphology of the hair roots suggest the diagnosis of non-scarring or scarring alopecias. The wash test (modified) consists in washing the hairs in a basin after refraining from shampooing for 5 days. All hairs collected on the basin floor (properly covered with a gauze) are counted and divided into hair shorter and longer than 3 cm. The former is considered vellus hairs. The global number of shed hairs indicate the severity of hair loss (telogen effluvium when >100), while the percentage of vellus hairs indicates the severity of androgenic alopecia. Video dermoscopy and photo- trichogram techniques could be used for follow up and control of therapy. [9,10]

Vitamin D and hair

There is some significant evidence that hair loss is caused by vitamin D deficiency. Vitamin D is a main stimulant for the hair follicle to grow. Some researchers also link its deficiency to alopecia areata. Research shows that people with alopecia areata have much lower levels of vitamin D than people who do not have alopecia. Other researches shows that women with other hair loss types also had lower levels of vitamin D. Vitamin D plays a role in the proliferation and differentiation of cells of skin and of new hair follicles. Researches and in vitro studies have supposed that VDR may play an essential role in the hair follicle maintenance postnatally. Keratinocytes, Cells of the Mesodermal papillae, and outer root sheath (ORS) all express VDR in all stages of the hair cycle in variable 16 degrees. In late anagen and catagen phases there are increase in VDR, which is accompanied by decreased keratinocytes proliferation and increased its differentiation. Those mechanisms are thought to affect the progression of the hair cycle. [11]

2. PATIENTS and METHODS

A case control study, conducted in the department of dermatology of Salah Al-Deen General Hospital in Tikrit city, Salah-Al-Deen province, Iraq, during the period from Nov 2019 to May 2020.

Inclusion criteria:

• Age from 18-39 years.

• complaining of diffuse hair loss for more than 6 months with generally good health.

Exclusion criteria:

• Secondary type's alopecia areata.

• Chronic diseases and Chronic medication. (like diabetes mellitus, hypo or hyperthyroidism, ulcerative colitis, cancer, .. etc) or on.

• Any patients psychologically disturbed.

• Familial hair shaft abnormalities.

• Women with FPHL, or family history of androgenic alopecia,

• Those who are on drugs for a long time,

• Those on improper diet regime, whom undergone a surgery recently

• Pregnant and breast feeders.

• Low serum ferritin.

Statistical Analysis: The data were reviewed, cleaned with double check entry into the computer using Statistical Package for Social Sciences (SPSS) version 20; then, it was coded by the researcher under supervision of the academic supervisor and statistician. The data presented as frequency and percentages tables, pie and bar charts were used also. A chi – square test was performed to assess relations between categorical variables. T-test was used for testing significance of difference between different numerical variables. A level of p – value equal to or less than 0.05 was considered significant, while odds ratio (OR) with its 95% confidence interval (CI) was calculated.

3. RESULTS

In this case control study, overall age of women ranged 18 – 39 years with a mean of 32.27 ± 5.94, however, both groups were not significantly different in age distribution , (P. value > 0.05), (**Table 1 and Figure 1**). The mean vitamin D3 level was 9.78 ± 6.5 ng/ml in cases (16.74 ± 7.0) in control group (**Figure 2)**. On the other hand, deficient vitamin D level (<12 ng/ml) was more frequent in cases than control group, 61.3% vs. 54.8%, with an odds ratio of 2.79 (0.48 – 16.33), so as for insufficient (12-20 ng/ml), vitamin D3 , 32.3% vs. 29% (odds ratio: 2.78 (0.43 – 18.04), and only 2 cases (6.5%) and 7 controls (11.5%) had optimal

vitamin D3 (>20 ng/ml), nonetheless, the differences in vitamin D3 level categories were statistically insignificant , in all comparisons, P. value > 0.05, (**Table 2**). From other point of view, among the total 62 women, 36 (58.1%) had deficient vitamin D3, 19 (30.6%) insufficient and only 7 women (11.3%) had optimal level of vitamin D3 of (> 20 ng/ml).

From other point of view, only 11 women (35.5%) in control group use sunscreens, of them 4 (12.9%) use it regularly and 7 (22.6%) irregularly, while 20 women (64.5%) did not use sunscreens, (**Figure 3**).

Table 1. Age distribution of the study groups

Age (year)	Cases		Controls		Total	
	No.	%	No.	%	No.	%
18 - 28	19	61.3	14	45.2	33	53.2
29 - 39	12	38.7	17	54.8	29	46.8
Total	31	100.0	31	100.0	62	100.0
Odds ratio (95%CI): 1.923 (0.677 – 5.234) P. value = 0.203						

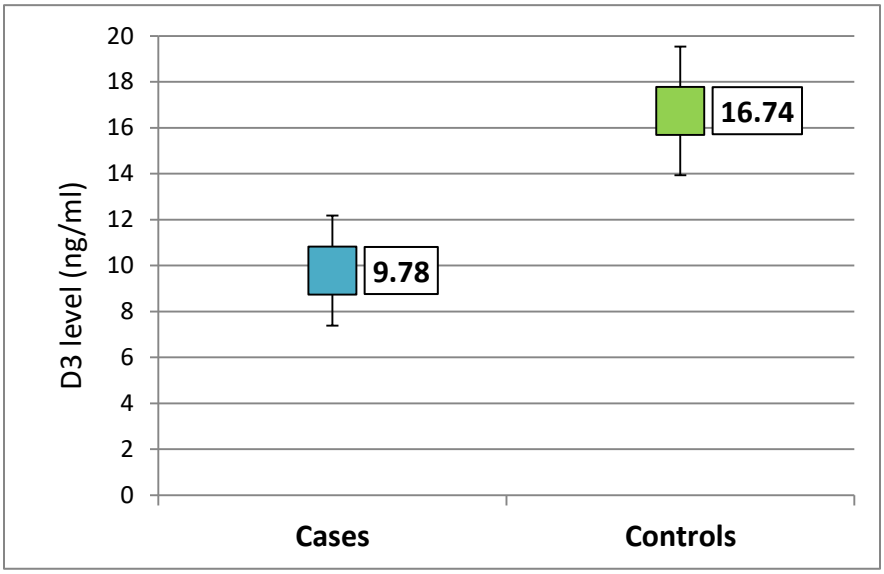

Figure 1. Mean vitamin D3 level and 95% confidence interval of mean in both studied group

Table 2. Vitamin D3 levels in both studied groups

D3 level	Cases		Controls		Total		Odds ratio (95%CI)	P. value
	No.	%	No.	%	No.	%		
Deficient	19	61.3	17	54.8	36	59.0	2.79 (0.48 – 16.33)	0.241
Insufficient	10	32.3	9	29.0	19	31.1	2.78 (0.43 – 18.04)	0.275
Optimal	2	6.5	5	16.1	7	11.5	1.0*	-
Total	31	100.0	31	100.0	62	100.0	-	-

95%CI: 95% confidence interval of Odds ratio
*reference group

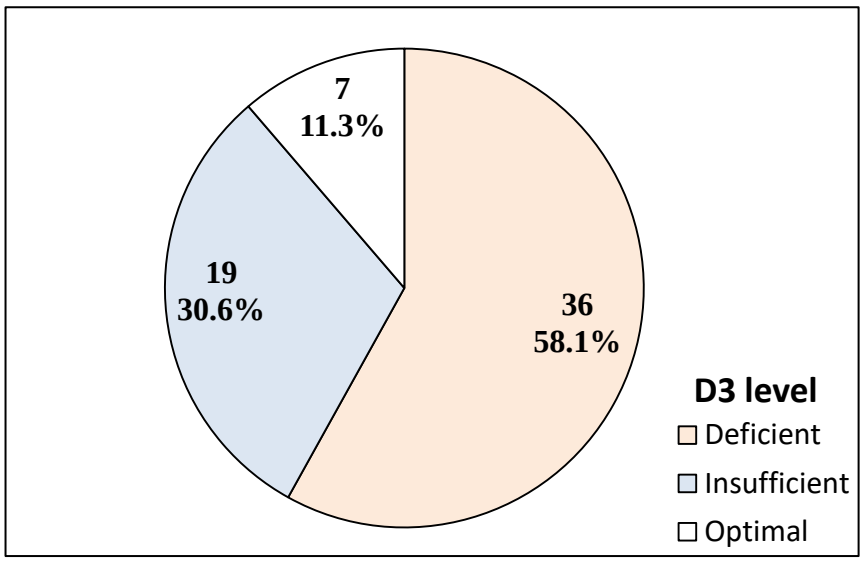

Figure 2. Overall distribution of Levels of D3 among 62 study participants

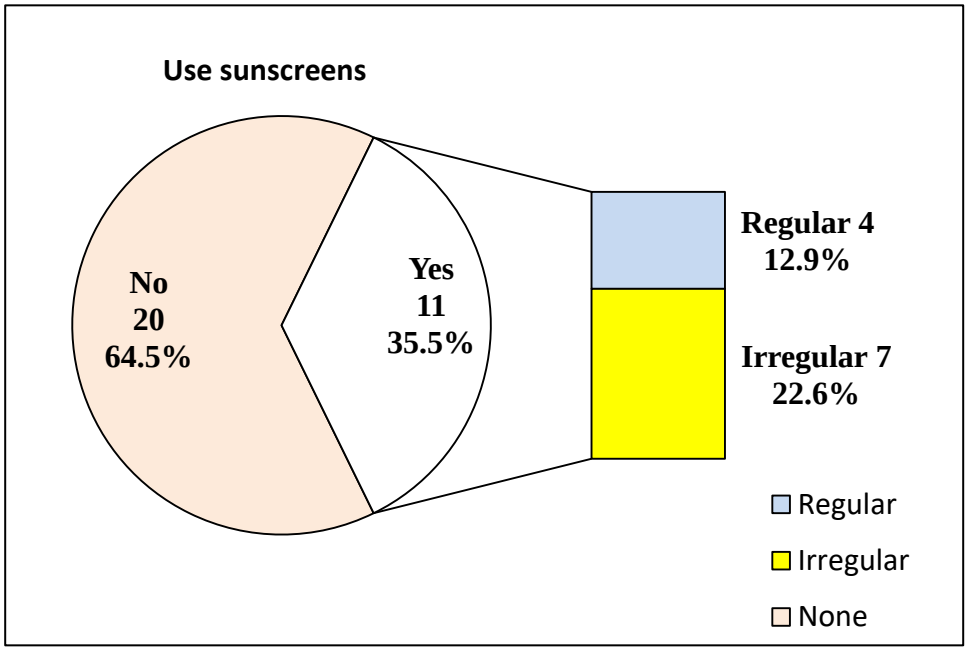

Figure 3. Distribution of control group according to using sunscreens

4. DISCUSSION

Recent years, in Iraq and world, there's an increased awareness and era of focusing efforts on vitamin D3 role and relationships to different diseases, among that hair loss have a great issue. Normal values of D3 level in adults as mentioned above. Results of our study although approved the relationship between lower levels of serum D3 and hair loss, both case and control groups share the fact that both have a mean situate in the insufficiency and deficiency state. Race and familial pattern, exposure to sun, clothes and life style, and chronicity of symptoms and amount of hair shed, may have a great role in affecting complainers. In Turkey, Nurşad Aslan in 2018 [(12)] declared that there is no correlation between TE and Vitamin D levels, despite the fact that D3 levels of cases was lower than that of control. The mean D3 levels in his study for patients and controls was 13.42 ± 6.28 ng/ml and 14.62±6.56 ng/ml, respectively. Despite, the lower level of serum D3 in cases group than in the control. Nursad Aslan had proved that the difference was statistically not significant (p=0.09), [(12)]

In our study the relationship was also insignificant in proving that D3 level is the cause or

the risk factor of CTE because of the pandemic low level in both cases and controls group, that were in the deficient and insufficient D3 level category respectively. Nayak K, et al, also find a significant relation between serum D3 level and diffuse hair loss, in his prospective case control study, with a median value of 41 vitamin D of 6.80 (interquartile range - 5.350–16.63) for the study population. Overall, 81.8% cases had Vitamin D deficiency compared to 45.5% of controls and this difference was statistically significant (P = 0.007).

Finally, Rasheed et al case control study, found that serum vitamin D levels in females with CTE (28.8 ± 10.5 nmol/l) and FPHL (29.1 ± 8.5 nmol/l) were significantly lower than in controls (118.2 ± 68.1 nmol/l; $p < 0.001$). These levels decreased with increased disease severity. The Indian study sample age group was 18-22 years old, and of small sample size less than 30, and the Egyptian one take level of D3 and ferritin collectively without exclusion. But all of those studies including our study were of low mean serum level of vitamin D3. In our society there is sufficient exposure to sunlight according to the previous studies (exposed face and arms for 1-2 hours weekly), with relatively a long summer months and days. [13]

Sunscreen use by females recently is increasing as being prescribed by a doctor or not, but till now its role in decreasing serum D3 level is controversial, and this do not affect our study. Generally, females should be encouraged to use it properly with exposing hands and legs to sunlight regularly. Intake of health supplements in our society is not common, they take it only as a treatment, recently vitamin D3 supplements is taken as prescribed or without prescription as a prophylaxis for diseases or hair full. Its intake does not affect our study since we give 1 month duration of withdrawal or more.

5. CONCLUSIONS

Serum vitamin D3 level in females is generally low. No significant association between vitamin D3 level and chronic telogen effluvium.

Ethical Clearance

Ethical clearance and approval of the study are ascertained by the authors. All ethical issues and data collection were in accordance with the World Medical Association Declaration of Helsinki 2013 for ethical issues of researches involving humans, verbal informed consent obtained from all participants. Data and privacy of participants were kept confidentially.

Conflict of interest: Authors declared none

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