ORIGINAL ARTICLE

Comparison between Serum Levels of Vitamin D and Zinc in Women with Diffuse non-Scarring Hair Loss (Telogen Effluvium) and Healthy Women

ARASH POUR MOHAMMAD[1], ATEFEH BABA[2], MOHAMMADREZA GHASSEMI[3]
[1]Medical Student, Student Research Committee, Faculty of Medicine, Iran University of Medical Sciences (IUMS), Tehran, Iran.
[2]Faculty of Medicine, Iran University of Medical Sciences (IUMS), Tehran, Iran
[3]Department of Dermatology, Rasoul Akram Hospital, Iran University of Medical Sciences (IUMS), Tehran, Iran
Correspondence to: Mohammadreza Ghassemi, Department of Dermatology, Rasoul Akram Hospital, Iran University of Medical Sciences (IUMS), Tehran, IranEmail: Ghassemi.mr@iums.ac.irTel: +98 2166502040

ABSTRACT

Background: Hair loss, a frequently reported problem, severely impacts the quality of life of patients.
Aim: To determination of serum levels of vitamin D and Zinc in women with diffuse non scarring hair loss (telogen effluvium) and it`s comparison with normal population.
Methods: This descriptive-analytical study conducted on Women with diffuse non scarring hair loss (n = 50) and controls (n=50)**.** The control group included healthy women who had referred to Dermatology clinic for cosmetic procedures (and other causes other than hair loss) and were age-matched to the patient group. To Determine the serum levels of Vitamin D and Zinc,blood samples were taken from all participants.Information were collected by the investigator. Statistical analyses were done using IBM-SPSS 25.0. and Chi-square test were used for data analysis.
Results: The mean serum levels of Vitamin D in patients and controls were respectively 23/8and 23/3 ng/ml($p > 0.05$).Also The mean levels of serum Zinc in patients and controls were 75/9 and 70/7 µg/dl Respectively($p > 0.05$). The mean serum levels of Vitamin D and Zinc in patients and controls had not statistically significant differences in terms of variables such asage, marital status, family history of hair loss, nocturnal awakening and BMI ($p > 0.05$).
Conclusion: Our study indicated that the mean serum levels of Vitamin D and Zinc had not statistically significant differences in women with telogen effluvium compared to healthy women.
Keywords: Telogen effluvium, vitamin D, zinc, hair loss, non-scarring hair loss

INTRODUCTION

Hair loss, a frequently observed problem, severely impacts the quality of life of patients and is often associated with loss of confidence and low self-esteem[1,2]. Usually, women consult a doctor at the earliest time with complaints of hair loss[2,3]. However, diffuse hair loss can affect both sexes of any age. Diffuse hair loss may have several causes, such as loss in the telogen phase, loss in the anagen phase, psychological stress, some systemic diseases, some medications, as well as diet[4].Hair loss can be due to the lack of iron and zinc which are responsible intelogen phase diffuse hairloss[5,6]. Also vitamin D is an important factor in cell growth, and deficiency of this vitamin can also lead to diffuse hair loss[1,4]. More than one billion people worldwide have been diagnosed with vitamin D deficiency[7]. Vitamin D deficiency is also observed in countries with high sunlight in all age groups[8].

The essential role of vitamin D in conjunction with calcium in the bone structure is undeniable, and other non-classic activities are also known for vitamin D.The role of vitamin D in immune system is one of the most important non-classic roles of this vitamin[9]. The active form of vitamin D plays the role of vitamin D by binding to its receptors in the target cell nucleus.According to research, vitamin D receptorsare highly expressed in the hair follicle stem cells[10,11]. The role of vitamin D deficiency in the development of immune diseases has attracted the attention of researchers in the last two to three decades. Studies have reported a link between vitamin D deficiency and autoimmune diseases, such as rheumatoid arthritis, systemic sclerosis, and lupus as well as cancer[12,13].Zinc compounds have been used for decades to treat disorders such as telogen effluvium and alopecia areata[14,15,16]. The results of studieshave shown that oral zinc sulfate has had significant effects in the treatment of alopecia areata and some patients with alopecia areata have a zinc deficiency[17,18,19]. Zinc is an important cofactor for many enzymes and is effective in important functions of hair follicle. It is also an important inhibitor of hair follicle regression and speeds up hair follicle recovery[17,18]. Since studies on blood levels of zinc and vitamin D in women with non- scarring hair loss are limited, this study was designed to evaluate the blood levels of these elements inwomen with diffuse non-scarring hair loss.

MATERIALS AND METHODS

Study design: This study was a descriptive cross-sectional study.The study population includedpatients with diffuse non-scarring hair loss referred to dermatology clinic of Rasool Akram Hospital during the year 2015 and 2016 who did not have exclusion criteria.All women were fasting andsampling method was convenience sampling.Written consent was obtained from patients to participate in this study and they were explained that if they do not want to participate in the study, routine treatment will be provided for them and they can be excluded from the study at any stage of the research.

Inclusionand exclusion criteria: The inclusion criteria were diffusenon-scarring hair loss and willingness to participate in the study. Exclusion criteria include: 1. Patients with other hair disorders or other causes of hair loss (such as tineacapitis, trichotillomania, secondary syphilis, androgenetic hair loss in women, scarring alopecia). 2. Patients with autoimmune disorders or systemic diseases (lupus, rheumatoid arthritis, scleroderma, thyroiditis, hyperthyroidism and hypothyroidism) 3. Taking supplements or receiving hair loss treatments during the last three months 4. Current consumption of alcohol, diuretics or laxatives containing Mg.

Study protocol and samples: The control group included healthy women who had referred to Dermatology clinic of RasoolAkram hospital for cosmetic procedures (and other causes other than hair loss) and had no exclusion criteria and were age-matched with the group of patients.The sample size was calculated based on the formula and taking into account the confidence coefficient 0.05 and the strength of the study 90% and the maximum sample size of 29 individuals in each group, but in order to increase the accuracy of the results, we finally divided the samples into two groups of 50 Cases and 50 controls.Blood samples were collected from all participants and sent to the lab to examine serum levels of vitamin D and zinc by the ELISA technique.In the analysis of data, trusteeship was observed and only the results were reported in general. no costs were imposed on patients, and during the study, researchers adhered to the Helsinki Treaties.The main limitationof this study was the non-cooperation of participants to give blood samples for testing, which we tried to encourage by talking to the patients and explaining the goals of the program for them.

Data collection: Required information included age, marital status, body mass index, history of pregnancy, family history of hair loss, duration of hair loss, serum zinc level and serum vitamin D level were collected by interviewing and from laboratory results. Datas were recorded in a pre-designed checklist and finally entered for statistical analysis.

Statistical analysis: All information gathered in checklists were entered into the statistical software SPSS version 25. The Kolmogorov-Smirnov test was used to test the normality of data distribution. To measure the mean of a quantitative variable between two groups, t-test or the non-parametric test of Yu Mann-Whitney was used. Chi-square test was used to compare qualitative variables. In this study, the level of 0.05> P.value was considered significant.

RESULTS

The mean serum level of vitamin D in the patient group was 23.82 ± 9.96 and in the control group was 23.39 ± 11.40 (ng / ml), which there was not statistically significant difference between the two groups (p> 0.05). The mean serum level of zinc in the case group was 75/99 ± 20/17and in the control group was 70/73 ± 18/09 (µg / dl), which was not significantly different between the two groups (p>0.05) (Table 1).

The mean serum level of vitamin D between the case group and the control group was not significantly different in terms of variables such as age group, marital status, family history of hair loss, nocturnal awakening and body mass index(p> 0.05) (Table 2).

Further, the mean serum level of zinc was not significantly different between control and case groupsin terms of variables of age group, marital status, family history of hair loss and night awakening (p> 0.05). However, based on body mass index, mean serum level of zinc was not significantly different between control and case group onnormal BMI (p>0.05).However, in patients with overweight and obese index, the mean serum level of zinc was significantly lower than that of the control group (p <0.05) (Table 3)

Table 1. Comparison of mean serum levels of vitamin D and zinc between the two groups of patients and controls

Biochemical Parameters	**Control group (50 persons)**	**Patient group (50 persons)**	
	Sd ± average	Sd ± average	P value
vitamin D level (ng / ml)	23.39 ± 11.40	23.82 ± 9.96	0.920
zinc(µg / dl)	70/73 ± 18/09	75/99 ± 20/17	0.219

Table 2. Comparison of mean serum levels of vitamin D between the two case and control groups

		Control group	**Patient group**	**P value**
		average ± Sd	average± Sd	
Age	Under 30 years old	23.08 ± 17.16	16.65 ± 10.83	0.242
	30-50 years old	18.17 ± 7.94	21.48 ± 13.03	0.556
	Above 50 years old	33.84 ± 17.25	48.57 ± 21.22	0.268
Marital status	Single	18.57 ± 8.58	17.12 ± 7.70	0.759
	Married	26.87 ± 9.19	26.43± 9.88	0.942
Family history of hair loss	Positive	22.75 ± 7.56	23.64 ± 11.43	0.941
	Negative	23.41 ± 13.73	23.85± 11.08	0.927
Nightly awakening	Yes	29.92 ± 8.68	13.61 ± 13.58	0.266
	No	22.82 ± 12.34	25.21 ± 10.92	0.604
body mass index (BMI)	Normal	23.52 ± 12.54	23.84 ± 8.43	0.956
	Overweight	24.30 ± 11.55	25.68 ± 13.01	0.874
	Obesity	21.23 ± 8.71	10.60 ± 3.67	0.258

Table 3. Comparison of mean serum levels of zinc between the two control and case groups

		Controlgroup	Patient group	P value
		average ± Sd	average± Sd	
Age	Under 30 years old	80.08 ± 21.19	81.14 ± 20.45	0.886
	30-50 years old	80.78 ± 18.58	73.41 ± 19.61	0.190
	Above 50 years old	81.68 ± 12.16	75.25 ± 22.74	0.444
Marital status	Single	81.45 ± 21.37	79.96 ± 14.77	0.822
	Married	80.20 ± 15.67	74.44 ± 21.90	0.238
Family history of hair loss	Positive	72.50 ± 0.71	84.12 ± 24.33	0.543
	Negative	81.07 ± 18.39	74.66 ± 19.42	0.110
Nightly awakening	Yes	87.30 ± 7.98	69.91 ± 36.26	0.302
	No	80.15 ± 18.65	76.81 ± 17.46	0.383
body mass index (BMI)	Normal	79.12 ± 18.83	79.11 ± 20.22	0.998
	Overweight	86.84 ± 19.29	70.20 ± 17.57	0.022
	Obesity	74.68 ± 9.85	63.45 ± 36.13	0.043

DISCUSSION

The role of vitamin D receptor in the hair cycle was first observed with alopecia in patients with Vitamin D-dependent rickets type IIA. These observations showed that the natural function of vitamin D receptor is essential for the initiation of the first postnatal hair cycle[20,21]. According to our findings, the mean serum level of vitamin D in the patients was 23.82 and in control group was 23.39 (ng/ml), which was not significantly different between the two groups.Contrary to our findings, Rasheed et al[22].showed that serum levels of vitamin D3 in women with telogen effluvium (22.1 µg / L) and women with female pattern hair loss (38.5µg / L) was significantly lower than healthy women (118.2 µg / L).These levels were lower with increasing hair loss. However, the mean serum levels of vitamin D in both studies in women with telogen effluvium were close to 23 ng / ml, but in our healthy individuals, the mean serum levels of vitamin D was lower than normal people in the populatioin, which may have been inappropriate due to low sample size. In the same study, in 2016, Banihashemi et al. evaluated the serum levels of vitamin D3 in patients with female pattern hair loss. Mean and standard deviation of serum levels of Vitamin Din patient and control groups were 13.45ng/ml and 17.16 ng / ml, respectively. They eventually observed the association between the incidence of FPHL and decreased serum levels of vitamin D3[23].Eshghi and colleagues, in a comparative study on vitamin D level in patients with hair loss and healthy individuals, observed that patients had lower levels of vitamin D than controls,and there was a significant relationship between hair loss and low levels of vitamin D.Female patients also had lower levels of vitamin D than the control group, and there was a significant relationship between them. This study showed that there is probably a relationship between vitamin D levels and hair loss in women[24].Another study in the year 2015 looked at the serum level of vitamin D3 in people with hair loss. In this study, the mean level of vitamin D in patients has been 26.17ng / ml and 66% of patients with hair loss had vitamin D deficiency[25]. Also a study by Mahamid et al. in 2014 showedthat the serum level of vitamin D in patients with alopecia areata was significantly reduced.Also, based on the analysis, serum CRP and vitamin D levels were significantly associated with alopecia areata[26]. The results of other studies as well as our study showed that the mean serum level of vitamin D in women with hair loss is lower than the normal mean of the population, but the reason for the absence of significant differences in the study between the patient and control groups is probably due to inappropriate sampling for the control group.

Because there is no doubt about the fundamental role of vitamin D in the cycle of hair growth, conducting prospective longitudinal studies and increasing the population of the statistical community can help to provide better results

Vitamin D and its receptor are involved in the differentiation of epidermal cells and hair follicles by influencing the expression of genes associated with keratinocytic cells[27]. The normal range of 25-Dihydroxy vitamin D is 30 g / ml[28]. The synthesis of this vitamin can be influenced by factors such as age, skin color and the use of sunscreens[29]. There are several mechanisms through which vitamin D can affect hair growth. This vitamin is a steroid hormone produced by epidermal keratinocytes which are induced by ultraviolet radiation (wavelength from 290 to 315 nm), or obtained by diet or supplements. It is estimated that about 3% of the human genome is directly or indirectly regulated by the endocrine system of vitamin D[30].

Our findings showed that the mean serum level of zinc in the case group was 75/99 ± 20/17 and in the control group was 70/73 ± 18/0 (µg / dl), which there was not statistically significant difference between the two groups. Consequently, according to the results of available studies, it has been shown that there is no evidence to support the role of low serum zinc concentrations in chronic telogen effluvium [31-35]. Yet, there are contradictory results in this regard. For example, AF Alexis stated in his study that zinc and iron are two main ingredients in hair growth[36]. Naginien et al. mentioned a low serum level of zinc in the blood and urine of children with alopecia areata[37]. In a study by Yasmeen J Bhat et al., mean serum level of zinc in patients with alopecia areata was 78 and in healthy individuals was 88. This difference was significant[38]. However, the mean serum level of vitamin D of patients in this study was similar to our study, but in normal individuals it was significantly higher than ours.Contrary to these results, Amirnia et al. (2011) investigated the serum zinc, copper, scalp and

serum levels of superoxide dismutase and glutathione peroxidase and malondialdehyde in patients with androgenetic alopecia and arthritis. The mean of zinc content in the hair of patients with alopeciaareata, androgeneticalopecia and control groups were 98.33, 105.35 and 129.52 (µg / dl), respectively.Zinc and copper content of the hair and serum of the patients in both groups were significantly lower in alopecia areata and androgenetic alopecia than in the normal population[39].In this regard, a case-control study by Dr. Abdel Fattah and his colleagues in 2015, comparing serum zinc level in new and resilient populations of alopeciaareata and normal population, showed that blood levels in patients with alopecia areata decreased compared with other people.Also, serum zinc level in this study has an inverse association with severity, duration, and resistance to treatment[40]. According to the results of our study, the mean serum levels ofvitamin D and zinc were not significantly different between the control group and the case group in terms of marital status, family history of hair loss, nocturnal awakening and body mass index.In study by AhmadiMoghaddam et al[25]. no difference was seen between the variables such as age, history of pregnancy during last year, BMI, background illness, family history of hair loss, diet and iron deficiency.

One of the limitations of this study was the lack of evaluation of response to treatment and its relationship with hair loss associated with vitamin D deficiency and also the need for longer follow-up of patients

CONCLUSION

Mean serum levels of vitamin D and zinc in women with telogen effluvium were different from those in normal women, but this difference was not statistically significant.

.At the end, in assessing patients, instead of the physicians' opinion, the use of devices such as trichograms or repeated photographs is recommended. It is also recommended to conduct more complete studies with a larger sample size and more precise sampling to investigate the issue.

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