Evaluating the serum zinc and vitamin D levels in alopecia areata

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Background: Alopecia areata (AA) is a common localized non-scarring hair loss. Vitamin D and such trace elements as zinc have significant immunomodulatory roles and are reduced in many autoimmune diseases. We aim to evaluate the zinc and vitamin D levels in AA patients belonging to an Iranian population.

Methods: We randomly recruited 77 patients with AA, and 112 age- and sex-matched normal subjects. Serum zinc and vitamin D levels were measured and compared between groups. Patients were considered vitamin D deficient or insufficient if 25-OH vitamin D levels were <10 and 10 to 30 ng/ml, respectively.

Results: Disease duration was 6.73±1.05 months. Compared to the control group, AA patients had significantly lower zinc (87.78±20.61 vs. 92.76±28.00, p=0.008) and vitamin D levels (20.23±11.11 vs. 25.63±15.90, p=0.01) and higher vitamin D deficiency (19.5% vs. 10.7%, p=0.03). There were significant correlations between AA duration and zinc levels (r=0.483, p<0.001); no recognizable relationship, on the other hand, was observed with vitamin D levels (r=0.022, p=0.84).

Conclusion: There were significantly lower levels of zinc and vitamin D in AA patients, compared to normal subjects. Zinc level is inversely correlated with disease duration, and both zinc and vitamin D play crucial roles in AA pathogenesis and are possible supplements in AA treatment.

Keywords: alopecia areata, vitamin D, zinc

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INTRODUCTION

Alopecia areata (AA) is a common localized non-scarring hair loss that occurs on any hair bearing skin present in 1% of the general population [1-3]. Genetic, environmental and autoimmune factors are considered as possible etiologies of AA, but the pathogenesis is yet to be fully understood..

A T cell-mediated organ-specific autoimmune disease [4-6], AA is associated with various autoimmune diseases such as vitiligo, atopy, Hashimoto's thyroiditis, diabetes mellitus, psoriasis, celiac disease and lupus erythematosus [1,3,7,8]. Certain studies have indicated that trace elements such as zinc either trigger the onset of AA or aggravate the disease [9]. Zinc, an essential trace element, affects almost all the metabolisms in body organs, including the skin [10]. Some studies have reported low levels of zinc in AA patients, indicative of its possible role in AA pathogenesis [9-11].

Involved in calcium homeostasis and bone metabolism, vitamin D acts as a transcription factor, regulating multiple downstream pathways involved in proliferation, apoptosis, and differentiation. Its role in controlling and regulating immune mechanisms is also well known [12,13]. Vitamin D is further associated with certain autoimmune diseases such as multiple sclerosis, diabetes mellitus, rheumatologic disease, and dermatologic diseases like AA [14-16].

Studies evaluating the level of zinc and vitamin D among Iranian patients with AA are rare, hence the objective of the present research to evaluate the vitamin D and Zinc levels in Iranian patients with AA [17-19].

MATERIALS AND METHODS

This is a case control study including 77 patients with alopecia areata and 112 age- and sex-matched normal subjects, randomly recruited from outpatient dermatology clinics, Sina Hospital, Tabriz, Iran during spring and summer 2017. Patients with other types of alopecia, and autoimmune dermatologic diseases in control group were excluded. Among other exclusion criteria were the use of immunosuppressive medication, zinc or vitamin D supplements or steroids, magnesium based laxatives, diuretics or alcohol, patients with congenital or acquired errors of calcium or phosphorus metabolism, obese subjects, pregnant or lactating women, subjects with skin phototypes V, and VI, smokers, and those with chronic systematic diseases. The study was approved by the ethics committee of Tabriz University of Medical Sciences.

Fasting blood samples were drawn from all participants; the concentration of zinc levels was determined using flame atomic absorption spectrometry method. Serum 25(OH) D was measured using a commercially available radioimmunoassay (RIA) kit. Vitamin D deficiency was defined as plasma levels of 25-OH vitamin D <10 ng/ml and insufficiency as 10 to 30 ng/ml [20]. Normal zinc levels were between 70-125 µg/dL.

All data were analyzed using SPSS22 (version 22; SPSS Inc., Chicago, IL). The results are expressed as Mean ± standard deviation or percentage. Chi square test, Fischer's exact test and independent T-test were employed to compare the data between the groups. The correlation between Zinc level and disease duration was evaluated using Pearson's correlation. *p*-values of less than 0.05 were considered as statistically significant.

RESULTS

Both groups were comparable regrading age, gender and skin type (Table 1). Disease duration in the case group was 6.73±1.05 months.

AA patients had significantly lower zinc and vitamin D levels compared to the control group (Table 2). Sufficient levels of vitamin D were also significantly higher in the control group compared to AA.

Table 1. Demographic findings of alopecia areata and the control subjects

	Alopecia areata	Control subjects	*P* value
Age (years)	27.38±11.94	29.54±13.65	0.26
Gender			
Male	40 (51.9%)	58 (51.8%)	0.26
Female	37 (48.1%)	54 (48.2%)	
Skin type			
III	62 (80.5%)	99 (88.4%)	0.13
IV	15 (19.5%)	13 (11.6%)	

Table 2. Zinc and vitamin D levels in alopecia areata and control group

	Alopecia areata	Control subjects	*P* value
Zinc level	87.78±20.61	97.76±28.00	0.008
Vitamin D levels	20.23±11.11	25.63±15.90	0.01
Vitamin D			
Deficiency	15 (19.5%)	12 (10.7%)	0.03
Insufficiency	47 (61%)	61 (54.5%)	
Sufficiency	15 (19.5%)	39 (34.8%)	

Significant correlations were observed between AA duration and zinc levels (r=0.483, p<0.001) (Figure 1), but not with vitamin D levels (r=0.022, p=0.84).

Mean involved area was 43.51±20.25. No correlation was found between the involved area (disease severity) with zinc (r=-0.066, pp=0.57) and vitamin D Levels (r=0.008, p=0.94).

DISCUSSION

Our results showed that the levels of zinc were significantly lower in AA patients compared to the control subjects.

There are conflicting results regarding the zinc level in AA patients. Similar to our findings, Aiempanakit and colleagues [21] observed significantly lower zinc levels in AA patients compared to healthy subjects. Bhat and colleagues [22] also reported lower levels of zinc in AA patients comparisons with control groups, which is also in accordance with the results of Abdel Fattah and colleagues [9]. However, Dastgheib et al., in a study on female Iranian patients with AA, reported no significant difference regarding zinc levels between the case

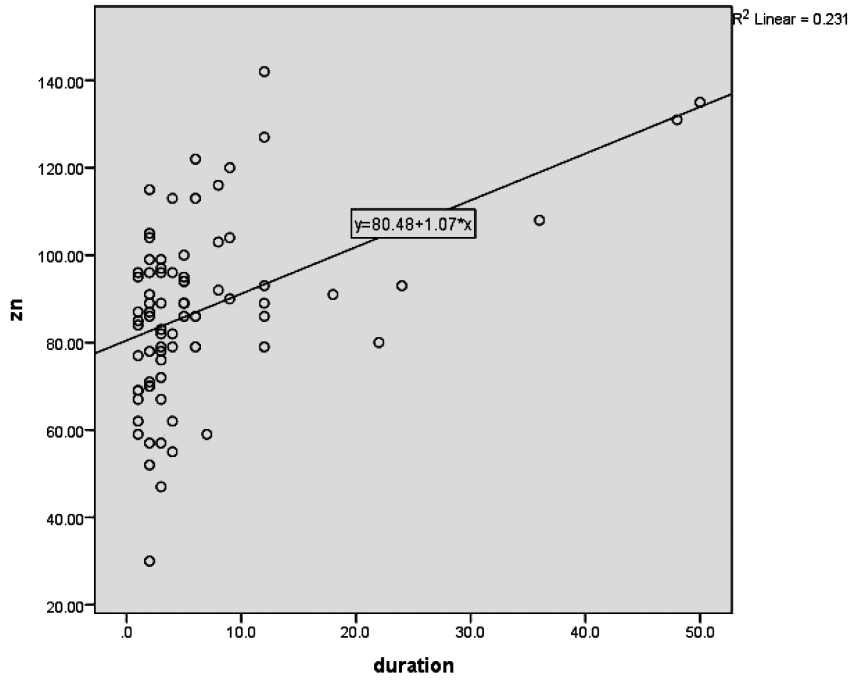

Figure 1. Significant negative correlation between zinc levels and disease duration (months)

and control groups [23]. Moreover, Mussalo-Rauhamaa and colleagues [24] reported no differences in zinc levels and other trace elements among Finnish AA and normal subjects.

In addition to the important role of zinc in the immune system, it influences the function of hair follicle metabolism. As an immunologic disease, lower levels of zinc occur in AA patients [11].

Further observed was the fact that serum zinc levels were reduced by the increase in the disease duration. Abdel Fattah and colleagues [9] also reported lower zinc levels in cases with prolonged duration. On the contrary, Bhat and colleagues [22] did not find any correlation between zinc level and disease duration. Aiempanakit and colleagues [21] observed lower zinc levels in prolonged cases, yet with no significant differences. These differing results could be due to the small sample size of some studies, methodology and variation in the studied populations.

In our study, vitamin D levels were also significantly lower in AA compared to the control group, which is in line with Bhat et al. [25] and Ghafoor and Anwar [26], where lower vitamin D levels were reported in AA patients compared to controls. Aksu Cerman and colleagues [27] reported higher vitamin D deficiency in AA patients compared to controls. Erpolat and colleagues [14], on the other hand, reported no significant difference between AA and normal subjects. It their study, vitamin D deficiency was higher (93.8% and 85.3%) in both groups.

Similar to Bhat et al. [25], we found no significant correlation between vitamin D levels and disease duration. Similarly, Aksu Cerman and colleagues [27] did not observe any correlation between vitamin D levels and disease duration.

A possible explanation for the difference in vitamin D levels in different studies could be the seasonal variations and geographical area where the study was conducted. In cold areas, as was the case with the present study, or in cold seasons, it is possible to observe lower vitamin D levels in all subjects.

We did not include disease severity in our analysis; however, almost all previous studies have indicated a significant correlation between vitamin D levels and disease severity [14,25-27].

CONCLUSION

In this study, we found significantly lower levels of zinc and vitamin D in AA patients compared to normal subjects. Zinc levels were inversely correlated with disease duration, a correlation not observed concerning vitamin D. Such findings are

suggestive of the role of both zinc and vitamin D in AA pathogenesis and AA treatment as possible supplements.

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Conflict of Interest: None declared.

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