Original Article

Serum zinc level in patients with alopecia areata

FatemaTuz Zohura[1], Md. Shahidullah Sikder[2], Abida Sultana[2], Jinan Bashar[3], Shusama Reza[4]

1. Assistant Professor, Department of Dermatology, Enam Medical College & Hospital, Savar, Dhaka, Bangladesh.
2. Professor, Department of dermatology and venereology, Bangabandhu Sheikh Mujib Medical University (BSMMU). Dhaka, Bangladesh.
3. Assistant Professor, Department of Dermatology, M H Samorita Hospital & Medical College. Tejgaon Dhaka - 1208.
4. Lead Dermatologist and Head of Sexual Medicine unit, Lifespring Limited, Dhaka.

Abstract

Background: Alopecia areata (AA) is a non-scarring, autoimmune disease of hair. Zinc is an essential trace element that strengthens cellular immunity by enhancing T-cell response and preventing oxidative cellular death. Recent epidemiologic studies have shown that zinc deficiency is rather frequent among alopecia areata patients.

Objective: To assess serum zinc levels in patients with alopecia areata and explore a probable relationship.

Materials and methods: This one-year case-control study was conducted on 48 diagnosed alopecia areata patients and 48 healthy age and sex-matched controls in the Department of Dermatology and Venereology, BSMMU. A semi-structured questionnaire was used to collect information. The Severity of Alopecia Tool (SALT) was used to assess disease severity, and 5ml of venous blood was collected from each participant for serum zinc level measurement of mean serum zinc levels was done between patients and controls. Correlations between serum zinc level and disease duration, as well as SALT scoring, were done in all patients.

Results: Out of 48 patients, the male to female ratio was 4.3:1 with a mean age of 26.69±6.93 range (14-45) years. The mean duration of the disease was 3.29±0.67 range (1-5) years. The mean ±SD serum zinc level in the patients' group (0.85±0.17) range (0.66-1.11 mcg/ml) was lower than in the healthy control group (0.95±0.28) (p=0.038). Serum zinc had a weak negative correlation with SALT score (r=-0.336, p=0.013) and no correlation with the duration of AA (r= -0.113, p=0.459).

Conclusion: Serum zinc levels may be considered as a biochemical marker for the severity of alopecia areata. Oral zinc supplementation may be a new therapeutic approach to alopecia areata.

Limitations: This study revealed that serum zinc levels in patients with alopecia areata were found to be within the normal range but lower than those of controls. Further studies may reveal a more significant relation between serum zinc levels and alopecia areata.

Keywords: Alopecia Areata, Zinc, Severity of Alopecia Tool (SALT)

Introduction

Alopecia areata (AA) is one of the most common autoimmune diseases targeting hair follicles, having a genetic and environmental influence.[1] It has a lifetime prevalence of 2%.[2] This is an acute or chronic and relapsing condition that leads to non-scaring hair loss from a small patchy area to even the whole body.[3] Though there are different hypotheses regarding the disease's pathogenesis, the exact pathophysiology has yet to be fully explored.[4] Zinc is one of the most important microminerals that has a

Corresponding author
FatemaTuz Zohura, Assistant Professor, Department of Dermatology, Enam Medical College & Hospital, Savar, Dhaka, Bangladesh.
E-mail: zohurahossain87@gmail.com
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vital role in almost all the steps of the metabolism of the body.[5] It is an essential metal moiety for various structural proteins, enzymes that exerts a crucial role in cell-mediated immunity.[6] It is a strong protector against hair follicle regression and accelerates its growth.[7] Hair loss is a well-documented feature of zinc deficiency where recovery of alopecia is possible with oral zinc supplementation.[8-9] The exact role of Zinc in hair fall is still an issue of contradiction.[8-10] The present study was conducted to see the serum level of zinc in patients with AA.

Material and Methods

This case-control study was conducted from 1st March 2017 to 28th February 2018, in the Department of Dermatology and Venereology, Bangabandhu Sheikh Mujib Medical University, Shahbagh, Dhaka, Bangladesh. It included 96 subjects; 48 patients with AA and 48 age- and sex-matched healthy controls. They were randomly selected from the dermatology outpatient clinic of Bangabandhu Sheikh Mujib Medical University. Ethical clearance for the study was obtained by the Institutional Review Board of BSMMU and fulfilled all the ethical aspects required in human research. Informed written consent was obtained from each participant.

Exclusion criteria included the use of zinc supplements, any form of steroid, supplements, or immunosuppressive agents within the past three months. Females who were pregnant or lactating, patients with any chronic autoimmune disease such as Vitiligo, Autoimmune thyroiditis, or IDDM, and patients who were not interested in participating in this study were also excluded. History was taken regarding age, sex, present illness, onset, duration of the disease, extension, family history. Then a complete dermatological examination was done to ascertain the pattern and extent of involvement of the disease. The disease severity of each patient was measured by using the severity assessment tools, namely (SALT).[11] The scalp was divided into four areas, namely: a. Vertex: 40% (0.4) of scalp surface area; b. Right profile of scalp: 18% (0.18) of scalp surface area; c. Left profile of scalp: 18% (0.18) of scalp surface area; and d. Posterior aspect of the scalp: 24% (0.24) of scalp surface area.

The SALT score was the sum of the percentage of hair loss in all the above-mentioned areas. Sub-grouping of patients into SALT subclasses will be done as follows: scalp (S): S0, no hair loss; S1, < 25% hair loss; S2, 25–49% hair loss; S3, 50–74% hair loss; S4, 75–99% hair loss; and S5, 100% hair loss. Body (B) hair loss was assessed as B0, no body hair loss; B1, some body hair loss; and B2, 100% body (excluding scalp) hair loss.

With all aseptic precautions, five milliliters of fasting (6–8 h) venous blood was taken from the mid cubital vein of each subject participating in this study, left to clot, then centrifuged to separate serum in the Kidney Research Lab, BSMMU. Serum was stored frozen in Eppendorf tubes at -20 °C until used. Serum zinc level was measured by using the sphectophotometric method with a spectrophotometer wavelength 213.9 nm in Bangladesh Atomic Energy Commission. According to the manufacturer, the serum zinc level will be considered normal at values of (0.60–1.10) mg/ml.[6] After getting the report, the values of the biochemical variables were documented on the data collection sheet.

Statistical analysis

Statistical analysis was carried out by using the Statistical Package for the Social Sciences (SPSS) software version 23.0 for Windows (SPSS Inc, Chicago, Illinois, USA). Continuous data were expressed as the mean ± standard deviation (SD) and categorical variables were expressed as percentages. The Independent student t-test and Chi-square test were used for comparing serum zinc levels in Alopecia areata patients and healthy individuals. Pearson's correlation was used to see the relationship between the serum zinc level and the duration of the diseases in patients. The Chi-Square test was used for categorical variables.

Results

This case-control study was conducted on 48 patients with alopecia areata and 48 healthy age and sex-matched controls. Males made up the vast majority of participants in both groups. Almost half of the patients were between the ages of 21 and 30, with a mean age of (26.69 6.93).duration of the disease was (3.29 ±0.67) years with a range from 1 year to 2 years. No exclamation point hair was present. Each patient had normal nails.

SALT scoring was done to assess the severity of the disease by their site of involvement and extension of the patch, 15 (31.3%) patients had severity S1 (<25%), 8 (16.6%) patients had severity S2, S3 (50-75%), 16.6% patients had S2 (25-49%), and 35 (52.1%) patients had extensive involvement. The

maximum number of patients (91.7%) had no body hair loss and only 8.3% had body hair loss (Table I).

Table-I: Comparison of demographic and clinical characteristics of patients and healthy group

Variables	Group A (Case) (n=48)	Group B (Healthy) (n=48)
Age (Years)		
Range	14-45	15-50
Mean±SD	26.69±6.93	29.44±10.2
Sex(N %)		
Male	39(81.3%)	32(66.7%)
Female	9(18.8%)	16(33.3%)
Dura on of the disease (Years)		
Range	1 – 5	
Mean±SD	3.29±0.67	
The pa ern of hair loss(N%)		
Patchy	44(91.7%)	
AT/AU	4(8.3 %)	
Degree of disease severity (SALT score)		
	15(31.3%)	
S2 (moderate)	8 (16.6%)	
S3 +S4+S5(severe)	35(52.1%)	
Body hair loss		
Pa ents without body hair loss	44 (91.7%)	
Pa ents with body hair loss	4(8.3%)	

AT: Alopecia totalis; AU: Alopecia universalis; S: Scalp hair loss, SALT: Severity of alopecia tool

Serum zinc level in alopecia areata patients was more than the normal range (70.8%) and in the deficient state was (29.2%). On the other hand in the healthy control group more than the normal range (87.5%) and the deficient state was (12.5%). The difference between the two groups was statistically significant. Mean of plasma zinc levels lower than those in the controls with statistical significance. Mean ±SD serum zinc level in patients group was (0.85±0.17) and control group was (0.95±0.28) with a significant p-value (0.038) (Table II).

Table-II: Comparison of serum Zinc between two groups (n=96).

Serum zinc status	Group A (Case) (n=48) No. (%)	Group B (Healthy) (n=48) No. (%)	P value
Normal (≥0.63µg/ml) Deficient (<0.63µg/mL)	34(70.8%) 14(29.2%)	42(87.5%) 6(12.5%)	0.044*
Total	48(100.0%)	48(100.0%)	
Mean±SD Range (0.66-1.11µg/mL)	0.85±0.17 (0.68-1.20µg/mL)	0.95±0.28 (0.53-1.90µg/mL)	0.038

*chi square test

Table-III: Correlation of serum zinc (µg/ml) with SALT and duration of AA (n=48).

	r value	P value	Significant
SALT	-0.336	0.013	Significant
Duration of AA	-0.113	0.459	Not significant

*significant

Serum zinc level was significant moderate negative correlation with SALT score (r= -0.336, p=0.013) and insignificant weak negative correlation with duration of AA (r= -0.113, p=0.459) (Table III).

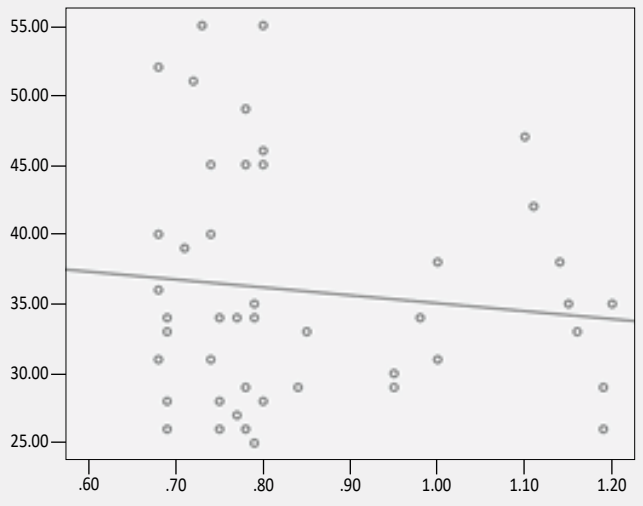

Figure I: Correlation of serum zinc with the duration of AA disease (years)

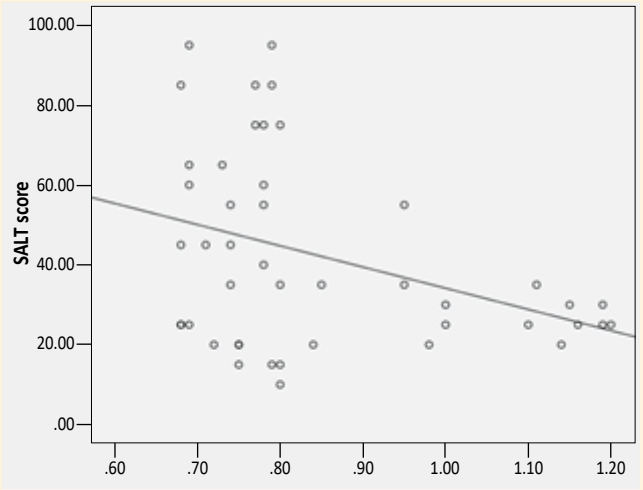

Figure II: Correlation of serum zinc with the duration of AA disease (years)

Discussion

Alopecia is a great concern for the patient due to its devastating cosmetic disfigurement with low self-esteem and health-related quality of life.[12] A lower level of zinc in the blood and urine of children with alopecia areata was found in a study by

Naginiene et al.[13] A good number of studies have attempted to find the association of inadequate zinc levels with AA.[13-16] Kil et al analyzed a large number of patients with hair loss where a lower level of serum zinc was associated with AA.[17] In the present study, a significant percentage of patients with AA were zinc deficient compared with healthy controls.

Some authors tried to establish the relationship between disease duration and zinc level in patients with AA. [15,21] A study by Abdel Fattah et al showed a significantly lower level of serum zinc with patients having recalcitrant AA of long duration (more than six months) rather than patients with AA for a short duration (r = -0.113, p=0.459), though this was not statistically significant.[21] Abdel Fattah et al also found a linear correlation between lower zinc levels with disease severity (SALT score). On the other hand, the current study failed to find any correlation between (table III) them which was consistent with Aiempanakit et al.[15]

Dietary facts and major confounding factors as well as other trace elements were not considered here and their relationship between disease severity and disease duration was not seen. More studies using large numbers of patients and longer durations are required to determine the serum zinc level as a biochemical marker of alopecia areata.

Nowadays nutritional zinc deficiency affects a large number of populations all over the world and it may be a silent cause of alopecia. Zinc supplementation can be used as a new therapeutic approach for alopecia. Few authors had been successfully dealt it with oral zinc supplements.[18-20] Some case reports also shown a good outcome with combination therapy of PUVA plus zinc, but the disease relapsed after cessation of therapy.[20]

Conclusion

As the exact etiology of alopecia areata is unknown, most of the proposed treatments have been unsatisfactory. Considering the significant psychosocial burden of alopecia areata, a combination of routine treatments and alternative therapies would be required to promote the patients' quality of life. This study found that the plasma zinc level in patients with AA was significantly lower than in participants in the control group. Considering the results of the current study and other studies mentioned, it can be concluded that the serum zinc level may serve as a biochemical marker of alopecia areata and a new therapeutic approach.

Conflict of interest:

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