A Study of Plasma Zinc Levels in Thais with Alopecia Areata

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Objective: *To study the correlation between the plasma zinc levels of Thai participants with alopecia areata (AA) and compare to the levels of Thais who do not have AA.*
Material and Method: *A cross-sectional study of thirty Thais with AA (case group) and thirty gender and age-matched healthy subjects (control group). All participants underwent blood tests measuring zinc and confounding factors.*
Results: *Participants in both groups were the same gender, 20 (66.7%) women and 10 (33.3%) men. The median age was 37 in the study group and 38 in the control. In the study group, the median disease duration was three months (interquartile range 1-6). Patients who had AA for more than three months had a lower mean plasma zinc level than those who had AA for less than three months without statistical significance (58.33±8.59, 62.43±13.19 µg/dL (mean ± standard deviation or SD), respectively, p-value = 0.40). The correlation between plasma zinc levels and disease duration of AA (p-value = 0.31) and the plasma zinc levels and the Severity of Alopecia Tool (SALT) score (p-value = 0.16) were not statistically significant. The mean plasma zinc level in the study group was lower than in the control group with statistical significance (61.20±12.00, 67.17±10.04 µg/dL (mean ± SD), respectively, p-value = 0.04).*
Conclusion: *The plasma zinc level in participants with AA is statistically significantly lower than in participants without AA. A more in depth study should be conducted to determine whether prescribing zinc supplement would be of benefit to AA patients.*

Keywords: *Alopecia areata, Zinc levels*

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Alopecia areata (AA) is a non-scarring hair loss condition that can occur and recur in male or female at any age and on any part of hair-barring areas[1,2]. In Thailand, the prevalence of AA was 2.4% in children[3]. A pathogenesis is an autoimmune disease by T-cell lymphocytes that target the bulb of hair follicles. Several autoimmune disorders, such as vitiligo, thyroiditis, or Addison's disease, are associated with AA[1,2,4].

Zinc is a trace element. It is an essential cofactor of enzymes and transcription factors that are necessary for human metabolism, reproductive function, immune systems, and wound healing process. Patients with a zinc deficiency present with a variety of symptoms including hair loss[5]. However, the effect of zinc on hair follicles is still unknown. Previous studies revealed conflict results of correlation between low plasma zinc levels and AA[6-9], but there existed no data on Thais with AA; therefore the authors sought to investigate plasma zinc levels in Thais with AA.

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Material and Method

A cross-sectional, case-control study was conducted between 2012 and 2014 in the Dermatology Outpatient Unit of Songklanagarind Hospital, Prince of Songkla University in Southern Thailand. The study included 60 participants, 30 patients with AA (study group) and 30 age- and gender-matched healthy controls. The inclusion criteria were patients with a clinical diagnosis by the dermatologists of AA who had received no treatment within three months prior to enrollment. People with conditions such as malnutrition, diabetes, essential hypertension, liver or renal diseases, chronic diarrhea and anemia, and currently using

medication or nutritional supplementations were excluded because these could affect the plasma zinc levels. The study was approved by the Research Ethics Committee, Faculty of Medicine, Prince of Songkla University.

The participants were given physical examinations and their medical histories were taken. The Severity of Alopecia Tool (SALT) score was used to ascertain the severity of hair loss[10]. This score was determined by the sum of the percentage of terminal hair loss in each of the four areas of the scalp, (a) left side 18% (0.18), (b) right side 18% (0.18), (c) top of scalp 40% (0.4), and (d) back of scalp 24% (0.24) multiplied by percentage area of the scalp in that area for a maximum score of 100. Researcher administered non-fasting venous blood test in the morning. Ten milliliters of blood was drawn and plasma zinc, albumin, blood sugar levels and white blood cell count were determined. Plasma zinc levels were measured using the Atomic Absorption Spectrophotometry Method (Varian SpectrAA 220, Australia), Albumin and blood sugar levels were measured using the Modular P800 Analyzer (Roche, Germany). White blood cell count was measured using the Sysmex XN3000 (Sysmex, Japan).

Statistical analysis

All statistical analysis was performed using Program R version 3.2.2, epicalc version 2.15.1.0. Quantitative variables were described using mean, standard deviation (SD), median, and interquartile range (IQR). Comparisons between the two groups were conducted using independent Student t-test and Wilcoxon Sign rank test. The *p*-value <0.05 was defined as statistically significant. Correlation analysis was conducted using Pearson's correlation and regression analysis.

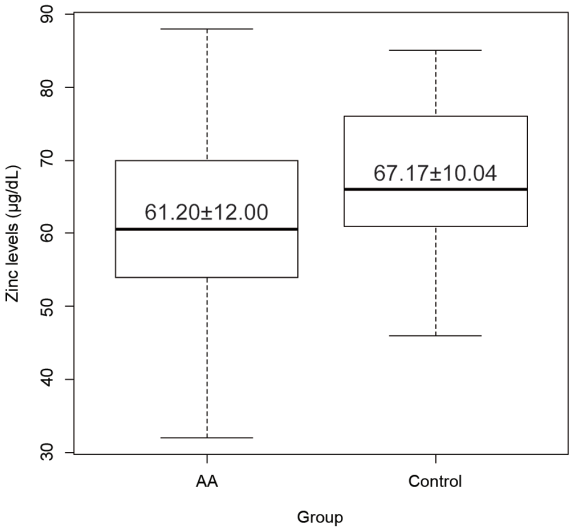

Fig. 1 Plasma zinc levels between both groups (mean ± SD).

Results

Participants in both groups were the same gender, 20 (66.7%) women and 10 (33.3%) men. The median age was 37 in the study group and 38 in the control group. There were no statistical significance in the white blood cell count (WBC), blood sugar (BS), and albumin levels as confounding factors of plasma zinc levels (Table 1).

Patients with AA showed mean of plasma zinc levels lower than those in the controls with statistical significance (61.20±12.00, 67.17±10.04 µg/dL (mean ± SD), respectively, *p*-value = 0.04) (Fig. 1).

In the study group, the median duration of AA was three months (IQR 1-6). The types of AA were single 17 (56.7%), multiple 10 (30.3%), alopecia totalis (AT) 1 (3.3%), and alopecia universalis (AU) 2 (6.7%). The mean plasma zinc level in patients who had AA for more than three months was lower than those

Table 1. Demographic data

Variable	AA (n = 30)	Control (n = 30)	*p*-value
Age (years), median (IQR)	37.0 (29.2, 49.8)	38.0 (29.2, 50.0)	0.97*
Gender, n (%)			1.00*
Male	10 (33.3)	10 (33.3)	
Female	20 (66.7)	20 (66.7)	
Confounding factors			
WBC (cells/mm^3), mean ± SD	7,067.5±1,737.6	7,335.7±1,660.7	0.55**
BS (mg/dL), median (IQR)	91.5 (88.8, 100)	93.5 (89.5, 98.5)	0.58*
Albumin (g/dL), median (IQR)	4.7 (4.5, 4.8)	4.6 (4.5, 4.8)	0.96*

AA = alopecia areata; WBC = white blood cell; BS = blood sugar
* Wilcoxon sign rank test
** Independent Student t-test

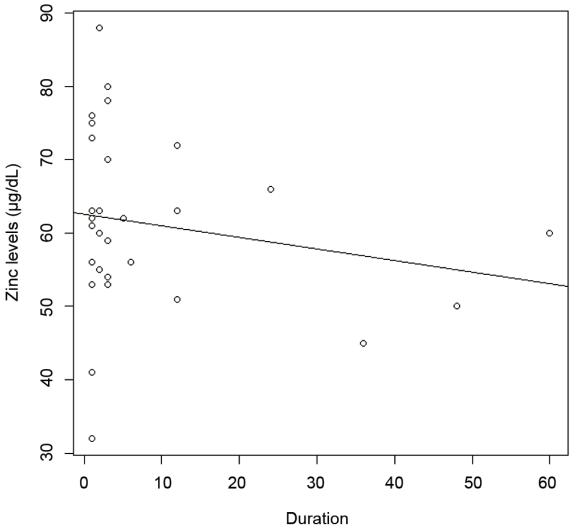

Fig. 2 No correlation between plasma zinc levels and duration (months) in patients with AA (p = 0.31).

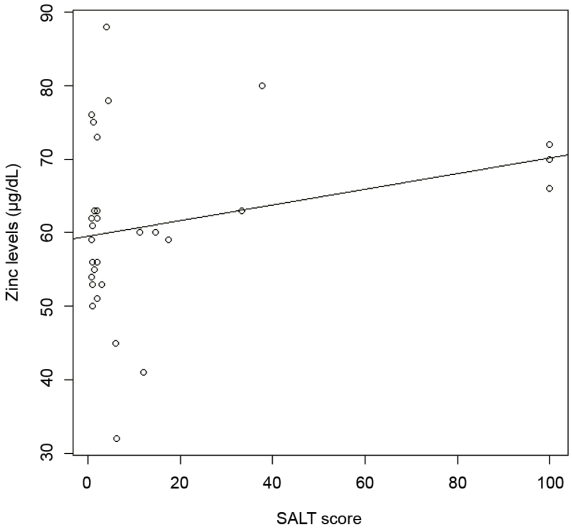

Fig. 3 No correlation between plasma zinc levels and SALT score in patients with AA (p = 0.16).

who had AA for less than three months without statistical significance (58.33±8.59, 62.43±13.19 µg/dL (mean ± SD), respectively, p-value = 0.40). In a linear regression analysis, there was no correlation between plasma zinc levels and the duration of AA (p-value = 0.31) as shown in Fig. 2. There was also no correlation between plasma zinc levels and the SALT score in patients with AA (p-value = 0.16) (Fig. 3).

Discussion

The study results revealed that the plasma zinc levels in patients with AA were statistically significantly lower than in the control group. These results support previous studies, the outcomes were shown in Table 2. However, a comparison of zinc levels between the two studies could not be done, as patients' race and method of venous blood collection were different. Dastgheib et al[8] did not detect significant difference in serum zinc levels between patients and those in the control group. Differences in sample size and/or race may have been the factors.

The duration of AA might have affected the plasma zinc levels; the patients who had AA for more than three months had lower plasma zinc levels than those who were newly diagnosed but not statistically significant difference. This correlation was found by Abdel Fattah et al[9] who discovered that patients with resistant AA (a duration of longer than six months and unsuccessful treatment) had significantly lower zinc levels compared with those with AA for less than six months.

Abdel Fattah et al[9] found a correlation between low zinc levels and the severity of AA using the SALT score. However, the authors did not detect this correlation, a low number of patients may have been the factor.

Park et al[11] studied the zinc supplementation in AA patients who had low serum zinc levels and found positive therapeutic results 66.7% (9 in 15 patients) without statistical significance. Two recent cases reported in France found that patients with AT who initially received a combination of PUVA therapy and

Table 2. The studies of plasma zinc levels (µg/dL) in patients with AA

Studies	Country	AA, mean ± SD	Control, mean ± SD	p-value
Bhat et al., 2009[6]	India	n = 50, 78.00±7.45	n = 50, 88.00±8.78	<0.05
Kil et al., 2013[7]	Korea	n = 93, 84.96±24.25	n = 32, 97.94±21.05	0.01
Dastgheib et al., 2014[8]	Iran	n = 16, 134.00±46.00	n = 27, 136.76±41.00	0.877
Abdel Fattah et al., 2015[9]	Egypt	n = 50, 75.48±11.78	n = 50, 85.70±12.50	0.001
The present study	Thailand	n = 30, 61.20±12.00	n = 30, 67.17±10.04	0.04*

* Independent Student t-test

zinc supplementation had a therapeutic response, but they experienced hair loss again after the cessation of treatment. The France patients then received zinc supplementation again over a long period and there was hair regrowth[12].

A more in-depth study with a larger number of participants, especially participants who have had AA for a long time, and an intervention using zinc supplementation on a longer term basis should be conducted.

The present study allowed the researchers to evaluate confounding factors that interfere with plasma zinc levels; however, the study was limited because of the small sample size.

Conclusion

The authors found that the plasma zinc level in patients with AA was statistically significant lower than in participants in the control group. Further studies should be conducted to determine whether prescribing zinc supplement would be of benefit to patients with AA especially those who had AA for more than six months.

What is already known on this topic?

There is a correlation between low plasma zinc levels and AA patients, particularly those with resistant AA and those who have a severe case of AA. Studies of the use of zinc supplement with AA patients did not show significantly positive results.

What this study adds?

The present study supports the results of previous studies showing that the plasma zinc levels in participants with AA is lower than in participants in the control group. This is the first study that the participants were all Thai. The patients who have had AA for longer duration trended toward lower plasma zinc levels.

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Potential conflicts of interest

None.

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การศึกษาระดับสังกะสีในพลาสมาในประชากรไทยที่มีภาวะผมร่วงหย่อม

กัมพล เอี่ยมพนากิจ, กนกพร จิรัฐติกาลวงศ์, ธวัชชัย เชื้อประไพรศีลป์, สว่างพงษ์ จันดี, เสาวรัตน์ เอื่อเพิ่มเกียรติ

วัตถุประสงค์: *เพื่อศึกษาความสัมพันธ์ของระดับสังกะสีในพลาสมาในประชากรไทยที่มีภาวะผมร่วงหย่อมโดยเปรียบเทียบกับประชากรไทยที่ไม่มีภาวะผมร่วงหย่อม*

วัสดุและวิธีการ: *การศึกษาแบบตัดขวางโดยมีกลุ่มผู้ป่วยคือประชากรไทยที่มีภาวะผมร่วงหย่อมจำนวน 30 คน เทียบกับกลุ่มควบคุมคือผู้ที่ไม่มีภาวะผมร่วงหย่อมโดยมีอายุและเพศตรงกับกลุ่มผู้ป่วยจำนวน 30 คน ผู้เข้าร่วมทั้งหมดได้รับการตรวจเลือดหาระดับสังกะสีและตัวรบกวนระดับสังกะสี*

ผลการศึกษา: *ผู้ร่วมการศึกษาทั้งสองกลุ่มประกอบด้วย เพศจำนวนเท่ากัน คือ เพศหญิง กลุ่มละ 20 คน (ร้อยละ 66.7) และเพศชาย กลุ่มละ 10 คน (ร้อยละ 33.3) ค่ามัธยฐานอายุกลุ่มผู้ป่วยเท่ากับ 37 ปี และกลุ่มควบคุม 38 ปี ในกลุ่มผู้ป่วยพบว่าค่ามัธยฐานของระยะเวลาการเป็นโรคที่ 3 เดือน (พิสัยควอไทล์ 1-6) ผู้ป่วยที่มีระยะเวลาการเป็นโรคมากกว่า 3 เดือน มีค่าเฉลี่ยระดับสังกะสีต่ำกว่าผู้ป่วยที่มีระยะเวลาการเป็นโรคมากกว่า 3 เดือน โดยมีค่า 58.33±8.59 และ 62.43±13.19 ไมโครกรัมต่อเดซิลิตร (ค่าเฉลี่ย ± ค่าเบี่ยงเบน) ตามลำดับ ค่า p เท่ากับ 0.40 ไม่พบความสัมพันธ์ระหว่างระดับสังกะสีกับระยะเวลาการเป็นโรค (p-value = 0.31) และระดับสังกะสีกับความรุนแรงของโรค (severity of alopecia tool score หรือ SALT score) (p-value = 0.16) ค่าเฉลี่ยระดับสังกะสีในพลาสมาในกลุ่มผู้ป่วยมีค่าต่ำกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ โดยมีค่า 61.20±12.00 และ 67.17±10.04 ไมโครกรัมต่อเดซิลิตร (ค่าเฉลี่ย ± ค่าเบี่ยงเบน) ตามลำดับ (p-value = 0.04)*

สรุป: *ระดับสังกะสีในพลาสมาของผู้ร่วมการศึกษาที่มีภาวะผมร่วงหย่อมมีค่าต่ำกว่าผู้ที่ไม่มีภาวะผมร่วงหย่อมอย่างมีนัยสำคัญทางสถิติ ดังนั้นการศึกษาเพิ่มเติมรวมถึงการให้สังกะสีทดแทนอาจมีประโยชน์ในกลุ่มผู้ที่มีภาวะผมร่วงหย่อมได้*