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Alopecia Areata and Body Mass Index: A Retrospective Analysis of 257 Cases

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Dear Editor:

A significant correlation of body mass index (BMI) with disease severity and treatment resistance in inflammatory skin diseases such as atopic dermatitis and psoriasis has been reported. Although the relationship between alopecia areata (AA) and obesity has been hypothesized by recent studies including a meta-analysis that described a meaningful association between AA and cardiovascular diseases[1] and another case-control study which revealed that patients with AA had a higher insulin resistance risk than healthy controls[2], clinical research on this topic is limited. This study aimed to evaluate the effect of BMI on the disease course of AA.

Patients with AA aged >19 years who visited our clinic between January 2011 and March 2019, were retrospectively reviewed. Patients taking systemic steroids within a month before the first visit, those diagnosed with malignancies, endocrinological diseases or severe diet reduction in last 6 months and those with subtype of acute diffuse and total alopecia were excluded. Demographic data, including age, sex, disease duration, type of current episode, initial Severity of Alopecia Tool (SALT) score, family history of AA and comorbidities, and treatment modalities were compared among four groups cat-

egorized by the BMI classification of the World Health Organization (WHO). SALT60 and SALT90 were defined as more than 60% and 90% hair regrowth, respectively, compared to the initial SALT score. The difference in prognosis according to BMI was evaluated using the Kaplan–Meier method.

This study was reviewed and approved by the Institutional Review Board of the Yonsei University Wonju Severance Christian Hospital (approval no. #CR319060).

Among the 257 patients, 176, 53, 14, and 14 were in the normal-weight, overweight, obesity, and underweight groups, respectively. The groups differed significantly in age, sex, type of current episode, initial SALT score, and presence of hypertension (Table 1). However, when determined based on either the SALT60 or SALT90 scores, the prognoses according to BMI were not significantly different. Moreover, the prognosis showed no significant difference even when the survival analysis was performed among groups divided by the quartile of the BMI of the subjects in the study, instead of the WHO classification (Fig. 1).

A relationship between AA and obesity might be theoretically anticipated from several perspectives. It is speculated that the characteristics commonly observed in obese patients, such as reduced functional diversity of the gut microbiome, aberrant cortisol response to chronic stimuli, and low serum vitamin D level, could be catalysts or bridges for the development of AA[3-6]. However, it is unclear whether these factors can directly induce the selective disruption of the immune privilege around hair follicles.

We assessed differences in the demographic data between the study groups. Although the interpretation was limited due to the deviation of some variables, especially age and sex, a higher proportion of initial SALT scores and recurrent epi-

Table 1. Comparison of demographic and disease-specific variables among groups divided by body mass index

Variable	Body mass index				p-value
	Normal (18.5~25.0 kg/m^2)	Overweight (25.0~30.0 kg/m^2)	Obesity (>30.0 kg/m^2)	Underweight (<18.5 kg/m^2)	
No. of patients	176	53	14	14	
Age (yr)	42.43±13.59	42.26±12.29	42.79±13.54	30.92±9.38	0.019*
Duration (mo)	6.51±14.07	8.94±16.46	6.34±6.23	7.25±9.49	0.751
Sex					0.007*
Male	86 (48.9)	32 (60.4)	10 (71.4)	2 (14.3)	
Female	90 (51.1)	21 (39.6)	4 (28.6)	12 (85.7)	
Type of current episode					0.009*
First-time	129 (73.3)	39 (73.6)	6 (42.9)	6 (42.9)	
Recurrent	47 (26.7)	14 (26.4)	8 (57.1)	8 (57.1)	
Extra-scalp involvement	23 (13.1)	8 (15.1)	0 (0)	2 (14.3)	0.526
Initial SALT score					0.036*
<25	134 (76.1)	44 (83.0)	8 (57.1)	6 (42.9)	
25~50	30 (17.0)	8 (15.1)	4 (28.6)	5 (35.7)	
>50	12 (6.8)	1 (1.9)	2 (14.3)	3 (21.4)	
Comorbidity					
Atopic dermatitis	13 (7.5)	2 (3.8)	0 (0)	3 (21.4)	0.086
Diabetes mellitus	6 (3.5)	2 (3.8)	2 (14.3)	1 (7.1)	0.311
Hypertension	10 (5.8)	8 (15.1)	6 (42.9)	0 (0)	<0.001*
AA family history	23 (13.1)	6 (11.3)	1 (7.1)	1 (7.1)	0.830
Treatment modality					
DPCP immunotherapy	59 (33.5)	23 (43.4)	7 (50.0)	7 (50.0)	0.284
Systemic corticosteroid	24 (13.6)	3 (5.7)	1 (7.1)	1 (7.1)	0.375
Topical corticosteroid± superficial cryotherapy	88 (50.0)	26 (49.1)	5 (35.7)	5 (35.7)	0.579

Values are presented as mean±standard deviation or number (%). SALT: Severity of Alopecia Tool, AA: alopecia areata, DPCP: diphenylcyclopropenone. *Statistically significant (p<0.05).

sodes in the extreme-weight groups (obesity and underweight) suggested higher disease activity. Nevertheless, the overall clinical progress was not significantly correlated with obesity in the study.

Although obesity is conventionally assumed to be a fertile medium for various systemic diseases in terms of being a low-grade persistent inflammatory state, a significant association with obesity (especially BMI) has not always been established for autoimmune diseases including systemic lupus erythematosus and vitiligo in real world settings[7,8].

Given the paradoxical positive relationship between obesity and the efficacy of immunotherapy in malignant melanoma, the possibility of "catch-up" phenomenon can be considered for the ambiguous results in our study[9]. In other words, since the group with higher disease activity at the initial did not show a significant difference in overall prognosis from the normal weight group, it might imply that the group with higher disease activity at the initial had a higher capacity to be recovered by the treatment (in the background of intact protective mechanism against autoreactive T-cell immunity).

Moreover, as an uncontrolled inflammatory state by obesity would be more critical to the maintenance of specific disease than the BMI itself, the impact of BMI on progress is likely to be reduced in well-controlled obese patient (even if the BMI is high) with the treatment for comorbid disease other than
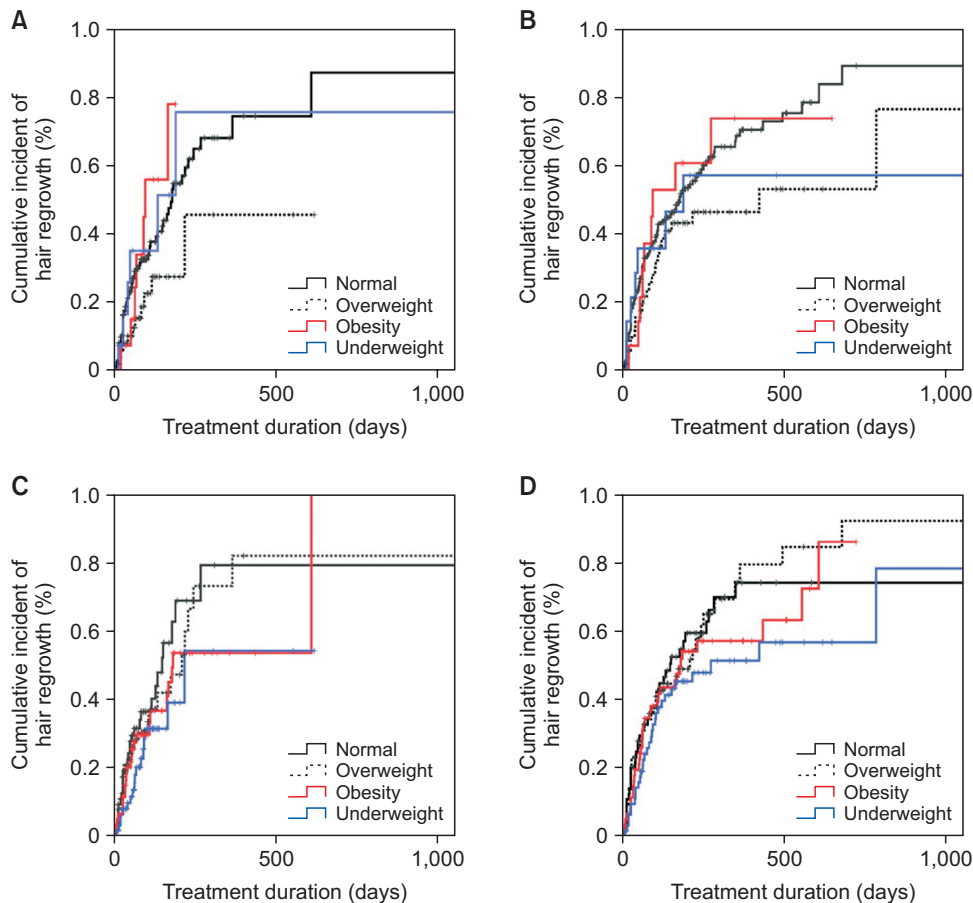
Fig. 1. (A, B) Cumulative incidence of hair regrowth according to body mass index (BMI) of World Health Organization classification. Each survival rate was estimated by Kaplan–Meier method based on SALT60 (>60% hair regrowth compared to the initial extent) (A) and SALT90 (>90% hair regrowth compared to the initial extent) (B). (C, D) Cumulative incidence of hair regrowth according to the quartile BMI of the subjects. Each survival rate was measured based on SALT60 (C) and SALT90 (D). All survival analysis showed no significant difference; BMI did not show statistical significance in Cox-proportional hazard regression analysis. Normal: 18.5~25.0 kg/m², Overweight: 25.0~30.0 kg/m², Obesity: >30.0 kg/m², Underweight: <18.5 kg/m².

AA. Especially, as a long-standing condition is a prerequisite for the induction of dysbiosis of gut microbiome or chronic dysregulation of the hypothalamus-pituitary-adrenal axis, the BMI was not enough to reflect this dynamic process in the cross-sectional view.

This study was limited by its single institutional retrospective design with only patients of a specific ethnicity. Further data on serum lipid profiles, hormone profiles (including serum cortisol), and vitamin D levels that could confound the clinical relationship between BMI and AA were not controlled. Another drawback was that patients belonging to the extremely obesity as per the WHO classification were not included in the analysis. Although the distribution of BMIs of the subjects in the study corresponded to that of the average adult population in Korea, further large-scale studies with sufficient numbers of subjects in each group are required to ensure objectivity.

In conclusion, the impact of BMI was not correlated with the overall prognosis of AA in clinical settings, although there were unique demographic features according to the BMI. Emerging concepts derived from the skin-gut axis and skin-brain axis will provide an insight for better understanding the comorbidities of AA. Notably, obesity seems to have a highly complex impact in clinical practice.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

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