

Do high BMI and Severe Androgenetic Alopecia go Hand in Hand? – A Cross-Sectional Study

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Abstract: *Context:* Obesity is a risk factor for multiple health problems but its association with androgenetic alopecia (AGA) remains controversial. *Aims:* To determine the presence of association between body mass index (BMI) and age of onset and severity of alopecia in men with AGA. *Methods and Material:* A cross-sectional study was conducted during the period of July 2014 to December 2014. 150 patients diagnosed with AGA were included in the study. The alopecia was diagnosed on based of clinical and dermoscopic evaluation and necessary laboratory investigations as and when required to rule out other causes of alopecia. The BMI of the patients was calculated by recording height in cm and weight in Kg. Family history of AGA was obtained. *Statistical analysis used:* This study investigated the relationship between AGA and BMI. Student t test was used for the analysis of continuous variables and Chi-square (χ^2) test was used for the analysis of binary variables. A p value less than 0.005 was considered to be statistically significant. *Results:* In all, 150 men were enrolled with a mean age at initial clinical evaluation was 31.50 years (range 18-51 years), the mean duration of AGA was 7.6 years (range 6 months to 24 years), the mean BMI was 26.05 Kg/m²(range 20-35 kg/m²). In all, 26 (17.3%) subjects were obese and 106 (70.6%) patients were overweight. 94 (62.6%) of patients had Grade 3 or 4 AGA while 44 (29.2%) had grade 5 and above grade of AGA according to Norwood- Hamilton scale. Out of the overweight or obese patients, 41.5% had severe alopecia while 58.5% did not have severe alopecia (p<0.000). *Conclusions:* Higher body mass index is associated with severe androgenetic alopecia in male pattern androgenetic alopecia (p <0.000 highly significant)

Keywords: Androgenic alopecia, BMI, body mass index, Obesity.

Key Messages: The link between obesity and androgenetic alopecia is a controversial issue. Our study found a positive association between BMI (an indicator of obesity) and severity of androgenetic alopecia in men.

1. Introduction

Androgenetic alopecia (AGA) is an androgen-dependent, hereditary physical trait resulting from the conversion of scalp terminal hairs into miniaturized vellus hairs in a characteristic pattern¹. Although the pathogenesis of AGA is generally regarded as androgen-mediated process, the contribution from other co-existing risk factors is likely, based on the observation of different patterns of AGA and the lack of responsiveness to anti-androgen therapy in a group of patients². Over the past 2 decades, there is association between AGA and metabolic syndrome or its associated diseases including cardiovascular diseases, hypertension and insulin resistance. Obesity is highly prevalent in metabolic syndrome. However, its role on AGA is unclear.³ This study aimed to investigate the association between obesity and the severity of alopecia among men with male pattern AGA using BMI as an indicator of obesity.

2. Subjects and Methods

Patient population and design

Male subjects with a clinical diagnosis of AGA between July 2014 to December 2014 at the department of dermatology, JJM Medical College, Davangere, Karnataka. After obtaining informed consent, clinical photographs were taken and clinical information of the patients with regards to age of the patient, age of onset, family history of AGA, presence of other chronic diseases and regular medications were collected. The diagnosis of AGA was made on clinical

examination and dermoscopic evaluation. The possibility of other hair diseases with diffuse hair loss such as telogen effluvium, diffuse alopecia aerata, thyroid diseases and nutritional deficiencies were ruled out by careful history taking, examination and laboratory tests (including haemoglobin, thyroid function tests, androgen hormone panel) were done as and when required. The severity of AGA was classified based on the Norwood-Hamilton scale.

Inclusion Criteria

Patients with clinically diagnosed and dermoscopically confirmed AGA willing to participate in the study.

Exclusion Criteria

Subjects with co-existing alopecia other than AGA, undetermined diagnosis of hair loss, presence of other factors or diseases that may cause hair loss, or prior use of finasteride, topical minoxidil, chemotherapeutic agents or other drugs that may interfere with hair growth before their first presentation were excluded.

Each subject participating in the study was subjected to the following:

Height measurements were taken thrice, with a maximum variation of 0.5 cm, and the average was considered. Weight measurements were done while the participants were using light clothes and no shoes. BMI was calculated as body weight/body height squared. Overweight was defined as BMI ranging from 23.0 to 26.9 kg/m² and obesity as BMI equal to or higher than 27 kg/m². BMI was either analyzed

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as a binary variable, high and low BMI, or a continuous variable for its association with the severity of AGA.

Statistical Analysis

This study investigated the relationship between AGA and BMI. Student t test was used for the analysis of continuous variables and Chi-square (χ^2) test was used for the analysis of binary variables. A *p* value less than 0.005 was considered to be statistically significant.

3. Results

A total of 150 male subjects who were newly diagnosed with androgenetic alopecia from July 2014 to December 2014 were included in the study. Among these participants a mean age at initial clinical evaluation was 31.50 years (range 18-51 years), the mean duration of AGA was 7.6 years (range 6 months to 24 years), the mean BMI was 26.05 Kg/m² (range 20-35 kg/m²). In all, 26 (17.3%) subjects were obese and 106 (70.6%) patients were overweight. 94 (62.6%) of patients had Grade 3 or 4 AGA while 44 (29.2%) had grade 5 and above grade of AGA according to Norwood- Hamilton scale. 41 (27.3%) of the patients gave maternal history of AGA and 121 (80.7%) gave paternal history of AGA. 21(14.0%) complained of urinary symptoms in addition to AGA. (Table I).

Out of the overweight or obese patients, 41.5% had severe alopecia while 58.5% did not have severe alopecia (*p*<0.000). BMI of the subjects with severe AGA (28.49 ± 2.0) was significantly higher than that of the subjects with mild to moderate AGA (26.3 ± 3.5) (*p* < 0.001) (Table II). The age at presentation and the duration of AGA was significantly higher in patients with severe AGA (*p* <0.001) (Table II, III). No significant association was found between severity of AGA and urinary symptoms, maternal history and paternal history.

4. Discussion

Androgenetic alopecia (AGA) is an androgen-dependent, hereditary physical trait resulting from the conversion of scalp terminal hairs into miniaturized vellus hairs in a characteristic pattern¹. The frequency and severity increase with age, and at least 80% of Caucasian men and ~50% of women show evidence of AGA by age 70 years^{4,5} Clinical features of AGA have been described as recession of the frontal hair line leading to balding of the scalp vertex. The hair loss progresses up till only a rim of normal hair growth at the sides and back of the scalp remains. Gradual transition also occurs from large thick pigmented terminal hairs to thinner, shorter, indeterminate hairs, and finally to non-pigmented vellus hairs in the involved areas when eventually hairs disappear completely. When hair loss is diffuse over the crown and frontal scalp with retention of the frontal hair line, it may resemble female pattern hair loss⁶. The Norwood-Hamilton classification is a method of clinically categorizing AGA.⁷

Body Mass Index (BMI) is calculated by determining weight in kilograms and height in centimetres and applying the formula BMI equals kilograms per centimetres square (Kg/cm²)

So far there are limited studies specifically addressing the association between obesity and AGA. Previous studies using BMI as a parameter for the degree of obesity showed controversial results. The association between AGA and metabolic syndrome, insulin resistance and cardiovascular diseases has been inconsistently demonstrated in studies that were based on different study populations and study designs. A study conducted in Finnish population demonstrated that BMI was significantly higher in young men with AGA of higher grade (grade III-VII) than young men with low-grade or no AGA by group comparison using Student t test.⁸ Our study too demonstrated that individuals with higher BMI reported severe AGA as well as had a greater age at presentation and greater mean duration of AGA.

The link between male-pattern AGA and obesity remains unclear. Possible explanations may include the presence of insulin resistance and up-regulation of insulin-like growth factor-1 in obese subjects.^{9,10} Insulin and insulin-like growth factor-1 are closely related peptide hormones that may induce 5 α -reductase activity, leading to an increased conversion of testosterone to dihydrotestosterone, the principle androgen responsible for male-pattern baldness.^{11,12} However, such hypothesis is hindered by the fact that the circulating dihydrotestosterone level is usually normal in male AGA subjects.³ AGA of early onset in men had been shown to be associated with higher risk of the development of coronary artery disease,¹³ insulin resistance, and metabolic syndrome,¹⁴ as compared with AGA of late onset or men without AGA. In our study, there was significant association between BMI and severity of AGA, however we did not find a positive association between BMI and early onset of AGA. The limitations of our study include the small sample size, however this study opens up a debate on the (1) significance of BMI in the pathogenesis of AGA (2) whether the relationship between BMI and AGA is causally associated (3) Will reducing BMI alter the course of AGA.

In summary, higher BMI is associated with a greater risk of severe AGA. However, further studies to elucidate the mechanism underlying their association will contribute to a better understanding of the pathogenesis of AGA and may help formulate newer modalities of treatment for AGA.

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	mean ± SD		p value
	severe	NON severe	
age(yrs)	36.34 ± 7.4	29.49 ± 5.6	< 0.000
duration (yrs)	11.09 ± 5.5	6.15 ± 4.5	< 0.000
BMI (kg/m ²)	28.49 ± 2.0	26.21 ± 3.5	< 0.000

Table III

	severe		NON severe		p value
	n	%	n	%	
urinary symp	6	13.6	15	14.2	0.934
maternal fh	9	20.5	33	31.1	0.185
paternal fh	35	79.5	86	81.1	0.823
Obesity [BMI>25]	44	41.5	62	58.5	<0.000

Table I: Clinical Characteristics of 150 men with androgenetic alopecia (AGA)

Characteristics	No. (n=150)
Mean visit age ± SD, y	31.50 ± 6.9
Mean duration ± SD, y	7.60 ± 4.3
Mean BMI ± SD, kg/m ²	26.88 ± 3.66
Normal BMI, n (%)	18 (12.0%)
Overweight, n (%)	106 (70.6%)
Obesity, n (%)	26 (17.3%)
History, n (%)	
Urinary symptoms	21 (14%)
Maternal history	41 (27.3%)
Paternal history	121 (80.7%)
Severity of AGA: Grade, n (%)	
Grade 2	12 (8%)
Grade 3	42 (28.0%)
Grade 4	52 (34.6%)
Grade 5	23 (15.3%)
Grade 6	16 (10.6%)
Grade 7	05 (3.3%)

Table II