Original Article DOI: http://doi.org/10.4038/sjdem.v13i2.7467

Early onset androgenic alopecia in males, a marker for metabolic syndrome? A case control study

Tomar S.S[1], Tiwari S.[2], Supekar B.B.[2], Singh R.P.[2]

[1] Department of Dermatology, Mayo Institute of Medical Sciences, Barabanki, Lucknow, India
[2] Department of Dermatology, GMC Nagpur, India

Abstract

Background:

Androgenic alopecia (AGA) is characterized by hair loss in a patterned manner. Metabolic syndrome (MS) is a cluster of inter related risk factors increasing the risk of atherosclerotic cardiovascular disease. Recently, few studies have linked early onset AGA to the risk of developing MS. However, there is a paucity of studies describing their association in Indian literature.

Aim of the study:

The aim was to analyze the association between early onset androgenic alopecia and metabolic syndrome as well as its individual parameters.

Materials & Methods:

A case control study was conducted for 2 years duration (January 2018 to December 2019). 100 Cases with AGA grade ≥ 3 in the age group of 18-35 years and 100 age and sex matched Controls without AGA were enrolled. AGA was graded according to Modified Norwood Hamilton scale. MS was diagnosed on the basis of International Diabetes Federation (IDF) definition. Statistical analysis was done using percentages, mean and standard deviation while statistical significance was assessed with the help of Fischer's test and student t test.

Results:

The mean age in Cases was 26.03 ± 4.42 and Controls was 26.25 ± 4.93years respectively. Most of the Cases had grade 3 AGA (27%). MS was present in 24% of Cases with AGA as compared with 9% of the Control group. Significant association was found between early-onset AGA and prevalence of MS ($p=0.004$, $p<0.05$). We found a significantly higher prevalence ($p<0.05$) of elevated blood pressure, elevated diastolic blood pressure, deranged blood glucose levels and elevated Triglyceride levels in Cases compared to the control group.

Conclusion:

We found a significant association between early onset androgenic alopecia and metabolic syndrome. Thus, it is advisable to screen patients with AGA at an early age for MS, to prevent significant cardiovascular morbidity.

Keywords: Androgenetic alopecia, Metabolic syndrome, Insulin resistance, Dyslipidemia, Hypertension, Central obesity.

Correspondence email: drsuyashsinghtomar@gmail.com

https://orcid.org/00000-0001-5502-4411

Introduction

Androgenetic alopecia is a genetically determined disorder characterized by an excessive response of hair follicles to androgena. AGA is the major cause of hair loss in both sexes.[1][2] The prevalence of AGA appears to vary between different races and ethnicities. It is estimated that prevalence rate in Caucasian populations is around 30% for men in their 30s, 40% for men in their 40s and 50% for men in their 50s. [3] In previous studies, early onset AGA is associated with several diseases, such as coronary artery disease (CAD), insulin resistance (IR), hypertension, abnormal serum lipid profiles, obesity, prostate cancer, benign prostatic hyperplasia, and some environmental factors, such as smoking. [4] Metabolic syndrome (MS) is a cluster of interrelated risk factors that increase the risk of atherosclerotic cardiovascular disease. There have been several definitions of MS, but the most commonly used criteria for definition at present are from the World Health Organization (WHO), the European Group for the study of Insulin Resistance (EGIR), the National Cholesterol Education Programme Adult Treatment Panel III (NCEP ATP III), American Association of Clinical Endocrinologists (AACE), and the International Diabetes Federation (IDF).[5,6,7,8,9] Different studies have reported the prevalence of MS among early onset AGA Cases to range between 40-50%.[4,10,11,12] This study was undertaken to analyze the association of MS with early-onset AGA as very few Indian studies have looked into the aspects of identifying the correlation between early -onset AGA and MS.

Materials & Methods

After obtaining ethical clearance (vide no. 1090), a case-control study was undertaken for a 2-year duration from January 2018 to December 2019. 100 male Cases of AGA with grade ≥3, between 18- 35 years of age with 100 age and sex-matched Controls without AGA having minor skin problems visiting the department of Dermato-venereo-leprology were enrolled. Patients having scarring alopecia, causes of alopecia other than AGA and patients taking hormonal therapy were excluded. Females were excluded from the study due to the variability of the etiology of alopecia in them. All patients were subjected to detailed history including duration of alopecia, thorough clinical examination, and grading as per modified Norwood Hamilton scale. Anthropometric measures such as height, weight, waist circumference, abdominal circumference, BMI and blood pressure were measured in all subjects. Fasting and post-meal blood sugar and lipid profile were tested in all study participants. MS was diagnosed according to the new International Diabetes Federation definition [9] in both groups as shown in Table 1.

The data was tabulated and analyzed using the statistical software STATA version 14.0. Quantitative data was presented with the help of mean and standard deviation. Comparison among the study groups was done with the help of unpaired t-test as per the results of normality test. Qualitative data was presented with the help of a frequency and percentage table. Association among the study groups was assessed with the help of Fisher test and student t-test. p value less than 0.05 was taken as significant.

Results

Majority of the patients in Cases belonged to the age group of 26-30 years (n=10, 41.7%) followed by 31-35 years (n=9, 37.5%), 21-25 (n=5, 20.8%) as depicted in Figure 1. The mean age in Cases was

Table 1 : New International Diabetes Federation definition of MS (2005)

MAJOR	Central obesity (defined as waist circumference with ethnicity-specific value ≥90 cm for Indian men)
Plus	(1) Raised triglycerides ≥150 mg/dl (1.7 mmol/L) or specific treatment for this lipid abnormality.
ANY TWO OF THE FOUR FACTORS	(2) Reduced high-density lipoprotein (HDL) cholesterol <40 mg/dl (1.03 mmol/L) in men and <50 mg/dl (1.29 mmol/L) in women or specific treatment for this lipid abnormality. (3) Raised BP: Systolic BP ≥130 or diastolic BP ≥85 mm of Hg or treatment of previously diagnosed hypertension. (4) Raised fasting plasma glucose (FPG) ≥100 mg/dl (5.6 mmol/L) or previously diagnosed type two diabetes.

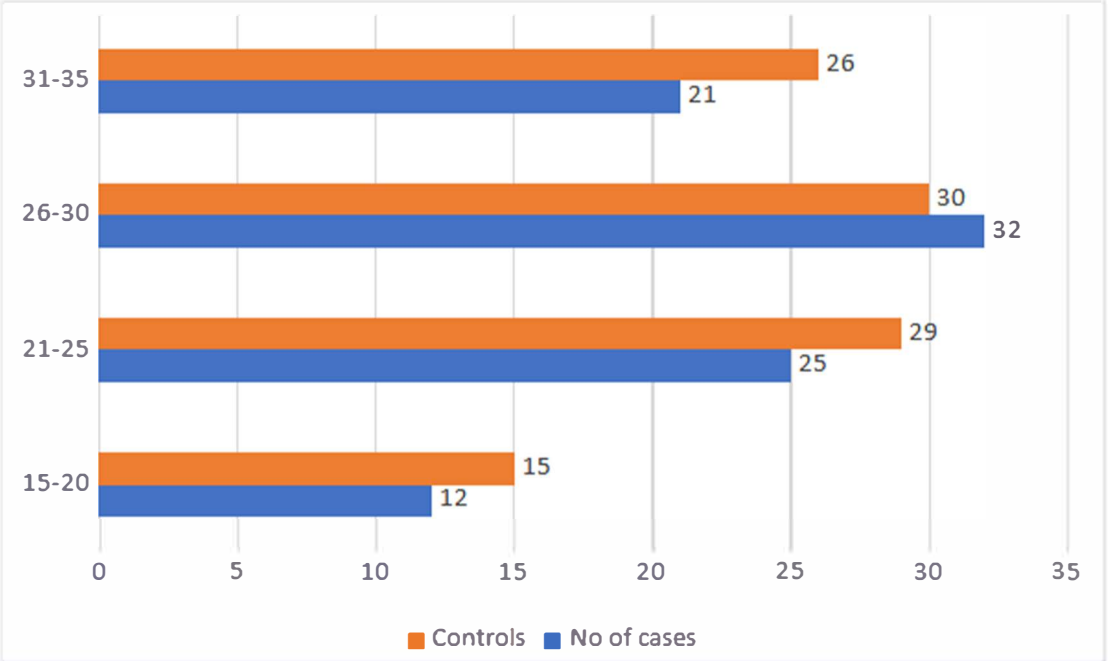

Figure 1: Age distribution of Cases and Controls.

26.03 ± 4.42 years, while in Controls it was 26.25 ± 4.93 years. According to modified Norwood Hamilton scale, most of the Cases had a severity of grade 3 (n=27, 27%) followed by grade 4 (n=17, 17%) as shown in Figure 2. Majority of the Cases had AGA since, more than 1 year (n= 73, 73%). We found a statistically significant association between duration and grade of AGA (p<0.001).

In our study, we found a significantly higher mean value of diastolic blood pressure (p-0.0002), total cholesterol (p-0.0009) and triglyceride levels (0.0007) in Cases as compared with Controls. However, there was no significant difference between mean values of systolic blood pressure, mean weight, mean height, mean waist circumference, mean body mass index, blood sugar, LDL and HDL between the Cases and Controls. The detailed statistical analysis of mean anthropometric and biochemical parameters in both groups is shown in Table 2 and Table 3, respectively.

In this study, MS was present in 24% of Cases with AGA as compared to 9% of the Controls. A significant association was found between early-onset AGA and prevalence of MS (p=0.004, p<0.05) as depicted in Figure 3. Among individual parameters of MS, there was significantly higher occurrence of raised BP (0.027, S), raised FBS (0.045, S) and raised TG (0.002,HS) as shown in Table 4.

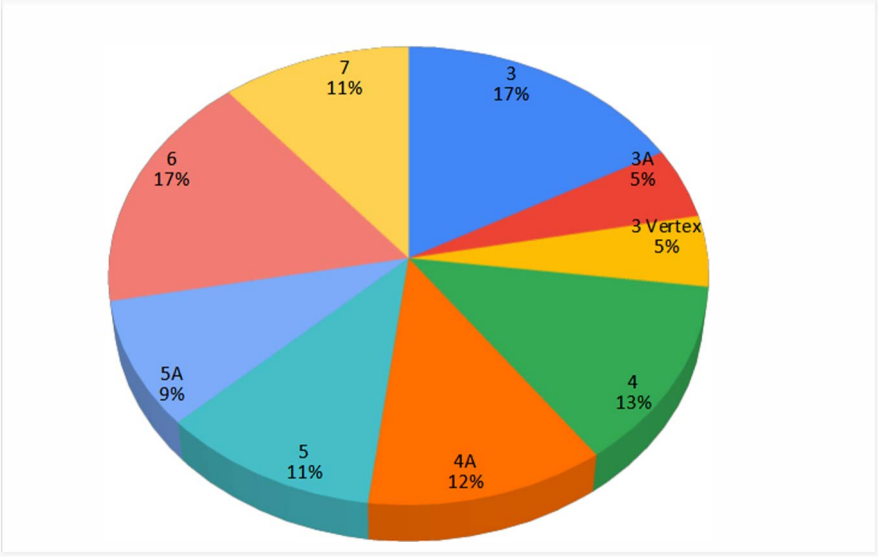

Figure 2: Distribution of Cases according to grade of AGA

Table 2 : Comparison of mean values of anthropometric & clinical parameters in Cases & Controls.

	Cases		Controls		
Parameter	**Mean**	**SD**	**Mean**	**SD**	**p value**
Height in m	1.7	0.064	1.69	0.068	0.4047, NS
Weight in Kg	68.55	11.81	66.88	8.79	0.2581,NS
BMI	23.49	3.81	23.15	2.11	0.4645,NS
Waist circumference (cm)	86.29	8.77	84.33	6.52	0.0747,NS
SBP (mm Hg)	121.66	7.41	121.0	6.68	0.5095,NS
DBP (mm Hg)	80.76	4.08	78.22	5.39	0.0002,HS

Table 3 : Comparison of mean values of biochemical parameters in Cases & Controls.

	Cases		Controls		
Parameter	**Mean**	**SD**	**Mean**	**SD**	**p value**
Total cholesterol (mg/dL)	179.01	40.47	159.87	39.57	0.0009
Triglycerides (mg/dL)	142.44	61.33	118.04	34.89	0.0007
HDL (mg/dL)	55.21	15.61	62.38	18.33	0.0033
LDL (mg/dL)	97.69	27.26	86.05	25.44	0.0021
FBS (mg/dL)	88.26	14.91	82.96	15.07	0.0133
PPBS (mg/dL)	137.23	24.55	129.68	12.46	0.0067

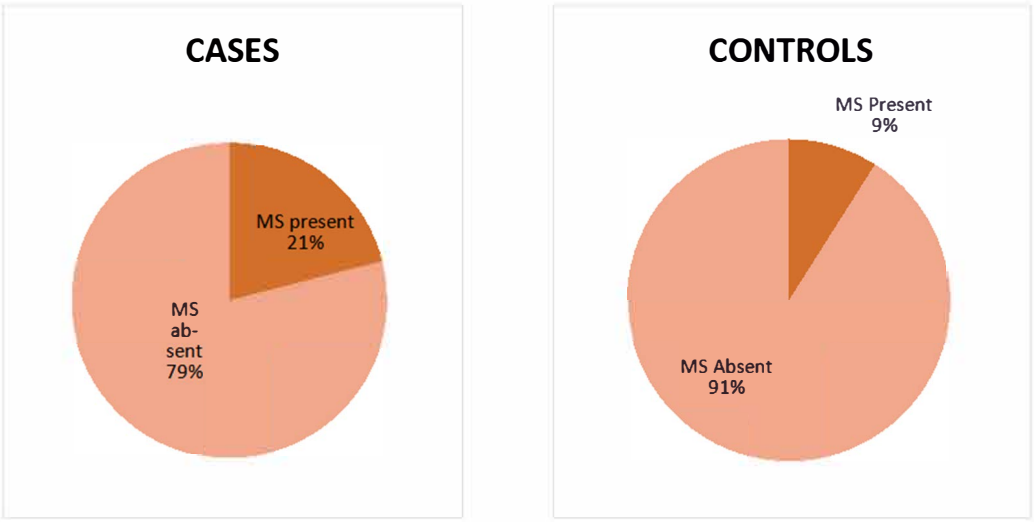

Figure 3: Comparison of occurrence of MS in Cases and Controls.

Discussion

Majority of Cases belonged to the age group of 26-30 years. In this study, 27% Cases had grade 3 while 25% had grade 4 AGA, followed by other grades. We observed statistically significant elevated blood pressure (≥130/85) in 26% Cases as compared to 12% Controls ($p < 0.027$). Similar findings were reported in the studies conducted by Banger HS et al and Gopinath H et al [4][12]. Raised blood pressure in AGA patients could be explained by the binding of raised androgens to vascular receptors, along with simultaneous hyperaldosteronism. Increased FBS also had a significant association

with AGA (p=0.045). This corroborated with the observations by Banger HS et al and Bakry OA et al. [4] [11] The mean values of total cholesterol, triglycerides and LDL were significantly higher in Cases when compared to the Controls (p=0.0009, 0.0007 respectively) while the mean value of HDL was significantly lower in Cases in comparison to Controls(p=0.0021). This correlates with the study by Banger HS et al where they have reported similar observations. [4] In contrast, Gopinath et al found no association between hypertriglyceridemia and AGA (p=0.619).[12] Insulin resistance and deranged lipid profile in AGA is also attributable to raised androgens.

In our study, MS was present in 24% of Cases with AGA as compared to 9% of the Controls. A significant association was found between early-onset AGA and prevalence of MS (p=0.004). This was similar to the studies conducted by Arias-Santiago S et al, Gopinath H et al, Banger HS et al and Chakrabarty S et al. [4,10,12,13] On multivariable logistic regression analysis, raised BP (Odd's Ratio=1.33), raised FBG (Odd's Ratio =1.21) and hypertriglyceridemia (Odd's Ratio =1.02) were the most significant risk factors for developing MS, as observed in our study. Bakry et al also reported raised BP (Odd's Ratio =1.02) and raised FBG (Odd's Ratio =1.01) as major risk factors for MS in their study. [11]

In the present study, the mean values of height, weight, waist circumference and BMI did not show any significant variations between Cases and Controls. Similar observations were reported by Chakrabarty S et al whereas Gopinath H et al reported central obesity to be significantly associated with grade of alopecia. [10,12] Also, no significant association was observed between the duration or severity of AGA and the prevalence of MS or its components. Gopinath H et al have found that only raised BP and elevated FBG were significantly associated with increased duration of AGA.[12]

The comparison of our study with similar studies is shown in Table 5.

Conclusion

In our study, there was a higher prevalence of metabolic syndrome among male Cases with early onset androgenetic alopecia as compared with Controls. However, no significant association was observed between the severity of AGA and MS. Early onset alopecia can be considered as a marker for metabolic syndrome. Thus, patients with early onset of androgenetic alopecia should be screened for the biochemical and anthropometric parameters of MS to prevent subsequent significant cardiovascular morbidity in such Cases.

Table 2 : Comparison of mean values of anthropometric & clinical parameters in Cases & Controls.

		Cases		Controls		
Parameter	**Cut off**	**Number**	**%**	**Number**	**%**	**p value**
Waist Circumference	>90	31	31	20	20	0.074
	<90	69	69	80	80	
Blood Pressure	SBP≥130 or DBP≥85	26	26	12	12	0.027
	SBP<130 or DBP<85	74	74	88	88	
FBS	>100	24	24	13	13	0.045
	<100	76	76	87	87	
TG	>150	31	31	13	13	0.002
	<150	69	69	87	87	
HDL	<40	14	14	12	12	0.674
	>40	86	86	88	88	

Table 5 : Comparison between similar studies.

Parameter	Our study Mean (SD)			Banger et al Mean (SD)			Chakrabarty et al Mean (SD)		
	Cases	Controls	p value	Cases	Controls	p value	Cases	Controls	p value
Age	26.03 (4.42)	26.25 (4.93)	>0.05	27.03 (5.36)	26.22 (5.10)	>0.05	26.44 (2.64)	25.65 (3.19)	0.081
BMI (Kg/m2)	23.49 (3.81)	23.15 (2.11)	0.4645	25.03 (4.35)	22.34 (3.41)	<0.05	24.11 (3.33)	23.01 (3.23)	0.03
WC (cm)	86.29 (8.77)	84.33 (6.52)	6.52	87.80 (11.28)	82.23 (9.89)	>0.05	84.79 (9.50)	86.47 (6.79)	0.186
Total cholesterol (mg/dL)	179.01 (40.47)	159.87 (39.57)	0.0009	175.92 (50.130)	151.01 (34.08)	<0.001	216.09 (32.92)	161.96 (26.85)	<0.001
Triglycerides (mg/dL)	142.44 (61.33)	118.04 (34.89)	0.0007	148.15 (61.27)	123.69 (52.28)	<0.05	197.84 (67.39)	98.04 (36.00)	<0.001
HDL (mg/dL)	55.21 (15.61)	62.38 (18.33)	0.0033	44.01 (6.867)	41.68 (12.53)	<0.05	37.26 (8.10)	48.64 (9.35)	<0.001
LDL (mg/dL)	97.69 (27.26)	86.05 (25.44)	0.0021	100.95 (44.15)	84.59 (31.89)	>0.05	143.93 (27.47)	94.85 (24.99)	<0.001
FBS (mg/dL)	88.26	82.96 (15.07)	0.0133	96.21 (30.31)	91.86 (19.12)	<0.05	83.22 (11.63)	85.78 (8.69)	0.107
SBP (mm Hg)	121.66 (7.41)	121 (6.68)	0.5095	124.5 (1.34)	119.5 (1.24)	>0.05	125.72 (8.96)	116.28 (7.78)	<0.001
DBP (mm Hg)	80.76 (4.08)	78.22 (5.39)	0.0002	87.89 (1.04)	82.47 (0.99)	<0.001	85.66 (7.67)	77.76 (6.18)	<0.001

References

1. Blume-Peytavi V, Kanti V. Androgenetic Alopecia. In: Kang S, Amagai M, Bruckner AL, Enk AH, Margolis DJ, Mc Michael AJ, Orringer JS, eds, Fitzpatrick's Dermatology, 9th ed. *New York:McGraw-Hill Education*; 2019. p. 1495-1506.

2. Cash TF. The psychological effects of androgenetic alopecia in men. *J Am Acad Dermatol* 1992 Jun;**26**(6):926-31.

3. Kaliyadan F, Nambiar A, Vijayaraghavan S. Androgenetic alopecia: An update. *Indian J Dermatol Venereol Leprol* 2013;**79**:613-25

4. Banger HS, Malhotra SK, Singh S, Mahajan M. Is early onset androgenic alopecia a marker of metabolic syndrome and carotid artery atherosclerosis in young Indian male patients?. *Int J Trichol* 2015;**7**:141-7.

5. Alberti KG, Zimmet PZ. Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: diagnosis and classification of diabetes mellitus provisional report of a WHO consultation. *Diabetic Medicine*1998;**15**:539-53.

6. Balkau B, Charles MA. Comment on the provisional report from the WHO consultation: European Group for the Study of Insulin Resistance (EGIR). *Diabetic Medicine* 1999;**16**:442-3.

7. Cleeman JI. Executive summary of the third report of the National Cholesterol Education

Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel III). *Journal of the American Medical Association* 2001;285:2486-97.

8. Einhorn D, Reaven GM, Cobin RH, et al. American College of Endocrinology position statement on the insulin resistance syndrome. *Endocrine Practice* 2003;9:27-52.

9. International Diabetes Federation: The IDF consensus worldwide definition of the metabolic syndrome, http://www.idf.org/metabolic-syndrome.

10. Chakrabarty S, Hariharan R, Gowda D, Suresh H. Association of premature androgenetic alopecia and metabolic syndrome in a young Indian population. *Int J Trichology.* 2014;6:50–53.

11. Bakry OA, Shoeib MA, El Shafiee MK, Hassan A. Androgenetic alopecia, metabolic syndrome, and insulin resistance: Is there any association? A case-control study. *Indian Dermatol Online J* 2014;5:276-81.

12. Gopinath H, Upadya GM. Metabolic syndrome in androgenic alopecia. *Indian J Dermatol Venereol Leprol* 2016;82:404-8.

13. Arias-Santiago S, Gutierrez-Salmeron MT, Buendia-Eisman A.A comparative study of dyslipidaemia in men and woman with androgenic alopecia. *ActaDerm Venereol* 2010;90:485-7.