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Original Research Article

A Study of Association of Metabolic Syndrome and Cardiovascular Risk Factors in Patients with Male Androgenetic Alopecia

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Abstract: Cardiovascular disease has a major impact on morbidity and mortality. Thus, an understanding of the relationship between male androgenetic alopecia and cardiovascular disease may be important in improving primary prevention. The objective of this study was to determine the magnitude of metabolic syndrome in patients with early-onset androgenetic alopecia. 240 men were studied, 120 with diagnosis of early-onset androgenetic alopecia and 120 control subjects who consulted for other skin conditions. In both groups, the criteria for metabolic syndrome according to the Adult Treatment Panel-III were studied (obesity, triglycerides, high-density lipoprotein Cholesterol, systolic and diastolic blood pressure, and blood glucose). Criteria for metabolic syndrome were met by 45% of the patients with androgenetic alopecia compared to 10% of the group B (P<0001). In a univariate analysis, abdominal obesity, systolic blood pressure, pressure>135mmofHg, triglycerides>150(mg/dl), and blood glucose levels >110(mg/dl) were significantly greater among patients with androgenetic alopecia. The high magnitude of metabolic syndrome in patients with androgenetic alopecia suggests cardiovascular screening should be done for early risk detection and primary prevention for cardiovascular disease.
Keywords: Cardiovascular disease, Cholesterol, androgenetic alopecia

INTRODUCTION

Alopecia induced by androgens in genetically predisposed individuals is termed androgenetic alopecia [1]. Androgenetic alopecia (AGA) is considered to be the most common type of baldness characterized by progressive hair loss [2]. AGA can affect all races, but the prevalence rates vary. Prevalence is considered to be highest in Caucasians. It is estimated that prevalence rates in Caucasian populations is around 30% for men in their 30s, 40% for men in their 40s and 50% for men in their 50s [2].

In the Indian context, a population based study of 1005 subjects showed a 58% prevalence of AGA in males aged 30-50 years [3]. Regarding the commonest type/grade of presentation (according to the Norwood classification), studies have shown differing results. A large study in the Indian population had type II as the commonest presentation of AGA.[4] Another study in an Indian population had type II and III as the commonest presentation [1].

Male Androgenetic alopecia has also been reported to be associated with metabolic syndrome (MS) including obesity, dyslipidemia, diabetes and hypertension. Epidemiological studies of the association between androgenetic alopecia and cardiovascular disease have produced varying results [4, 5]. While some have shown an increase in cardiovascular risk, especially in early-onset alopecia, others have failed to confirm this observation [6].

The pathogenic mechanisms underlying increased cardiovascular risk are: hyperinsulinemia, greater peripheral sensitivity to androgens, genetic origin and chronic inflammation. Cardiovascular disease has a major impact on morbidity and mortality. Thus, an understanding of the relationship between male androgenetic alopecia and cardiovascular disease may be important in prevention. So this study was carried out in the Department of Dermatology, Venereology and Leprosy at S.M.S Hospital (Charak Bhavan), Jaipur to find out the association of Metabolic syndrome and cardio vascular risk factors in cases with male Androgenic alopecia.

MATERIALS AND METHODS

Hospital based, observational-descriptive, comparative analysis. Conducted in Department of Skin, STD & Leprosy, SMS Hospital, Jaipur From June 2014 to September 2015 included 120 eligible male androgenetic alopecia (Age 35 to 55 years) patients at least type III according to the Hamilton-Norwood classification on first cum first basis. 120 eligible age & sex matched controls without androgenetic alopecia selected.

Other types of alopecia, Hormone replacement therapy with testosterone or corticosteroids**,** Psoriasis, acanthosis nigricans, skin tags and other diseases which may be associated with metabolic syndrome **,**Cutaneous lymphoma**,** or other neoplasms (except non melanoma skin cancer)**,** Patients taking treatment for androgenetic alopecia(only fresh cases) and patient refusal to give written informed consent to participate were excluded from the study

Statistical Analysis

Statistical analysis was performed with the SPSS, version 20 for Windows statistical software package (SPSS Inc., Chicago, ill, USA). The Categorical data were presented as numbers (percent) and were compared among groups using Chi square test. Groups were compared for demographic data were presented as mean and standard deviation and were compared using by students t-test. Multivariate logistic regression was used for finding the independent predictors for metabolic syndrome and androgenic alopecia. Probability P value <0.05 was considered statistically significant.

OBSERVATION AND RESULTS

DEMOGRAPHIC PROFILE

The mean age was 44.71±6.04years in Group A and 44.16 ±6.013 years in Group B. The presentation according to grading in Androgenic Alopecia was Grade 6 (25.83%) followed by 25.83% grade 5, grade 7 was 20%, grade 4 was 16.67% and least were 12.5 % in grade 3. The duration of diseases was 11.06±2.946 (7 to18Yrs). Most patients (50%) had disease duration of 7 to 10 years.

Table 1: Characteristics of the cases and controls

Variables		Group A(N=120)		Group B(N=120)		
		No	**%**	**No**	**%**	**P Value LS (Chi-square Test)**
Age Group	35 to 40	39	32.5	40	33.33	0.107 with 3 degrees of freedom; P=1.000NS
	41 to45	24	20	25	20.83	
	46 to50	29	24.17	29	24.17	
	51 to55	28	23.33	26	21.67	
		Mean	SD	Mean	SD	
BMI		27.33	3.804	26.84	3.687	**0.31NS**
Waist circumference(cm)		95.69	8.888	93.31	9.256	**0.043S**
Systolic BP(mm hg)		132.17±11.56		125.43±8.99		<0.001S
Diastolic BP(mm hg)		86.37±5.57		82.88±4.32		<0.001S
Blood sugar		99.94	21.93	92.82	17.49	0.006
Total Cholesterol		208.64	15.16	197.36	15.86	<0.001SS
Triglyceride		142.68	17.24	136.89	15.63	0.007
HDL		42.33	8.71	46.95	10.16	<0.001SS
LDL		133.43	13.33	122.56	11.06	<0.001SS
VLDL		32.88	8.84	27.9	7.57	<0.001SS

The mean BMI was 27.33±3.804 in group A while in group B was 26.84 ± 3.68. No significant difference was observed according to BMI (P=0.31NS). The mean value of waist circumference in Group A and Group B was 95.69 ± 8.88 and 94.31±9.25cm respectively which was statistically significant (p=0.04).

Significantly higher mean systolic and diastolic blood pressure was observed in group A as compared to group B.(P<0.001S). The mean of fasting blood glucose in Group A was 99.94±21.93 mg/dl and in Group B was 92.82±17.49mg/dl which was statistically significant (p=0.006).

Table 2: Risk Predictors for Metabolic syndrome for Androgenic Alopecia

	Group A		Group B		Odds ratio (95% Confidence interval)	Chi square Test
	No	%	No	%		P Value LS
WC >102 (cm)2	32	26.67	18	15	2.061 (1.082 to3.924)	P = 0.039
Systolic BP >130(mm hg)2	56	46.67	24	20	3.500 (1.973 to6.210)	<0.001S
SBP>135/85mm of Hg	74	61.67	33	26	5.766 (2.198 to15.130)	<0.001S
Blood Sugar>110(mg/dl)2	42	35.00	20	16	2.692 (1.464 to4.951)	0.002S
Triglyceride>150(mg/dl)2	47	39.17	24	20	2.575 (1.444 to4.592)	0.002S
HDL<40	47	39.17	26	21	2.328 (1.319 to4.109)	0.005S

Highly significant difference between serum total cholesterol, serum LDL serum HDL, serum VLDL and serum triglyceride between two groups. Chance of happening androgenetic alopecia were significantly more than 2 times increased in the presence of WC>102 as a risk factor.(OR=2.06)(P=0.039S); 3.5 time in presence of Systolic BP >135(mm hg) as a risk factor with or3.50(95% CI 1.973 to 6.210),BP>135/85mm of Hg with or5.766 (2.198 to15.130),2.6 times in presence of blood glucose levels>110 (mg/dl)with or 2.692 (1.464 to 4.951).

Criteria for metabolic syndrome were met by 45% of the patients with androgenetic alopecia compared to 10% of the group B Odds ratio = 7.364 (95% CI: 3.672 to 14.77) (P<0001). In an Univariate analysis, abdominal obesity, systolic blood pressure > 135 mm of Hg, triglycerides > 150 (mg/dl), and blood glucose levels >110(mg/dl) were significantly greater among patients with androgenetic alopecia.

A logistic regression analysis was done to predict metabolic syndrome for 240 patients abdominal obesity WC >102 (cm), systolic blood pressure>135 mm of Hg, DBP>85mm of Hg triglycerides>150(mg/dl), HDL<40 and blood glucose levels >110 (mg/dl) were as predictors. A test of full model was statistically significant. The Wald criteria demonstrated that WC>102(cm), systolic blood pressure>135 mm of Hg triglycerides>150(mg/dl), blood glucose levels >110 (mg/dl) and HDL<40(p<.05 S) made a significant contribution to prediction. Other predictors were not significant predictors. One unit change in the significant predictors, the log odds of happening chance of metabolic syndrome by 2.7 (for WC >102 (cm), 4.6 times systolic blood pressure>135 mm of Hg; 2.38 for blood glucose levels >110 (mg/dl) (3.96 times for (triglycerides>150(mg/dl), and 4.55 times for S.HDL<40.

Table 3: Multivariate analysis for Predictors for Metabolic Syndrome

	MEATBOLIC SYNDROME			
	Exp(B)	95% C.I. for EXP(B)		Sig.
		Lower	Upper	
WC >102 (cm)2	2.742	1.094	6.874	.031
SBP >135(mm hg)2	4.645	1.763	12.233	.002
DBP>85 mm of Hg	1.885	.708	5.021	.205
B. SUGAR>110	2.382	1.048	5.411	.038
TG>150(mg/dl)2	3.966	1.710	9.202	.001
HDL<40	4.550	2.025	10.222	.000

Thus, the determination of metabolic syndrome in patients with androgenetic alopecia suggests screening should be done to enable early detection of risk of developing cardiovascular disease and provide a potential opportunity for early preventive treatment.

DISCUSSION

The association between androgenetic alopecia and cardiovascular disease was first posited by Cotton *et al.;* in1972 [7]. Since then, although several epidemiology studies have investigated this association, the results have been inconsistent.

Mean systolic and diastolic blood pressure values were significantly higher in our cases. A recently

published study showed that 82% of patients with hypertension (>140/90 mm Hg) had alopecia, compared with 56% of those with normal blood pressure levels (P<.001), and confirmed that this association was independent of age [8].

The authors offered explanations for this association: First, the androgens involved in the pathogenesis of androgenetic alopecia bind to vascular receptors and favor the increase in blood pressure; and second, hyperaldosteronism, which is an underlying condition in most cases of hypertension, plays a direct role in the development of alopecia, according to the results of a study in which transgenic mice overexpressing mineralocorticoids developed alopecia [9]. However, the authors did not determine aldosterone values.

However, we did not find significant differences in testosterone values. Hirsso *et al.;* [10] also found higher blood pressure values in patients with androgenetic alopecia than in a control group(65% vs 45%), as well as a greater frequency of diabetes and hyperinsulinemia. However, a study published in 2007did not find statistically significant differences for systolic or diastolic blood pressure levels in patients aged less than35 years.

Mean HDL-C values, while somewhat lower in the case of patients with alopecia. Their plasma levels were strongly associated with physical exercise; the high rates of sedentary lifestyle explain the low HDL-C values. However, mean triglyceride values were higher in cases than in controls (142.68 mg/dL vs 136.89 mg/dL; P<.05).

Matilainen *et al.;* [11] found similar results when triglyceride levels in men with alopecia who had undergone revascularization due to heart disease were compared with those in a control group. Sharrett *et al.;* [12] studied both HDL-C and triglycerides in the general population and confirmed that the association with the presence of atheromatous plaque was not very strong; however, both were associated with coronary disease. Thus, the authors showed that high triglyceride values and low HDL-C values were associated with the transition from atheroma to atherothrombosis and that, therefore, control of both these cardiovascular risk factors is essential in patients with subclinical disease.

Blood sugar values were significantly higher in the cases (99.94 mg/dLvs92.82 mg/dL; P=.006). Abnormal fasting glucose levels were present in 35% of the cases. One of the most notable observations in the study by Hirsso *et al.;* [10] was that 21% of patients with androgenetic alopecia and 12% of the control group had diabetes. Hyperglycemia in patients with higher insulin values is explained by peripheral resistance to the action of insulin.

Metabolic Syndrome

45% of the cases met 3 or more of the criteria for metabolic syndrome, an essential criterion being the presence of abdominal obesity, according to the latest recommendations of the International Diabetes Foundation. Metabolic syndrome was diagnosed in only 10% of the control group.

The association between cardiovascular disease and metabolic syndrome is well documented. Recent studies show that people who meet ATP-III criteria are 2.59 to 3.5times more likely to have a cardiovascular event during the next 10 years [13, 14.

Furthermore, the authors of those studies state that the ATP-III criteria correlate better with cardiovascular disease than other criteria used to define the metabolic syndrome. No published studies analyze the prevalence of metabolic syndrome according to ATP-III criteria in individuals with androgenetic alopecia.

However, the prevalence of metabolic syndrome reported for the general population ranges from 11.7% [15] similar to the value found in our study—to 30% in the population of Brazil [16] with a mean value of 20% in some studies published in Spain [17, 18].

In our study, abdominal obesity was significantly higher among the cases; however, there were no significant differences between the groups in terms of weight or BMI, indicating that, among the cases, there is a redistribution of abdominal fat. This is an important cardiovascular risk factor associated with insulin resistance in many studies.

Matilainen *et al.;* [19] established the association between early-onset androgenetic alopecia and insulin resistance, although the mechanism by which insulin resistance affects alopecia is not clear. Klemp *et al.;* [20] reported that reduced blood flow in the scalp could be associated with early-onset androgenetic alopecia. There has also been a report of microvascular insufficiency in areas of alopecia [21].

The high frequency of metabolic syndrome in patients with androgenetic alopecia suggests screening should be done toenable early detection of individuals at risk and initiation of preventive treatment before cardiovascular disease becomes established.

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