

Is there any relationship between cardiovascular disease and androgenetic alopecia in men and women?

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Background: Worldwide, coronary heart disease is the most important cause of mortality and morbidity. Although numerous studies have documented the relationship between male pattern baldness and cardiovascular disease (CVD), few studies focused on this association in women. This study intended to evaluate the relationship between coronary artery disease and androgenetic alopecia (AGA) in both men and women.

Methods: This case-control study included 200 people, 100 (50 men and 50 women) with coronary heart disease (CHD) and 100 healthy control subjects (50 men and 50 women). Both groups were assessed for grading the severity of their baldness. The collected data were analyzed by the chi-square test.

Results: A total of 74% of participants in this group had hair loss severity of grades IV-VIII, however in the control group, 50% had remarkable hair loss. There was a significant association between coronary artery disease and hair loss grade IV onward in men ($P=0.038$) but this relationship was not observed in women.

Conclusion: Male patients with AGA are at greater risk for developing CVD.

Keywords: androgenetic alopecia, cardiovascular disease, male pattern baldness

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INTRODUCTION

Cardiovascular disease (CVD) is the most important cause of morbidity and mortality worldwide, hence assessment of risk factors is of great importance ^{1,2}. Coronary heart disease (CHD) is responsible for 50% of deaths in the U.S. and 46% in Iran.

Previous studies revealed that Iranian populations are at higher risk of CHD according to their behavioral, nutritional, and physical activity characteristics. In addition to medical treatment, changes in lifestyle, diet, and exercise have a tremendous effect in reducing morbidity and mortality rates ^{3,4}.

Androgenetic alopecia (AGA) is the most prevalent type of progressive, symmetrical diffuse hair loss that affects both sexes ⁵. Hair loss pattern

and its pathophysiology differ for both sexes. Hair is a symbol of youth, health and productivity in social communication. Hair loss has an unbelievable impact on self-esteem, social situations, and interpersonal relationships ⁶. Male pattern hair loss is an age-related feature commonly seen with aging. Hair loss affects 30% of men until their 30s and more than 50% at age 50 are affected by hair loss.

The relationship between male baldness and androgenic hormones is clear but the exact pathophysiology of hair loss in women is not completely understood. The role of androgens in female hair loss is not as prominent as in men. Androgenetic alopecia in women is diffuse, involves the central part of the scalp, and begins at an early age. This form of hair loss is contrary to post-menopausal baldness that occurs during the 50s, 60s, or 70s ^{7,8}.

A number of surveys have reported that AGA is more common in patients with CVD but their exact relationship is still unknown^{1,3,9}. Accurate and rapid identification of persons at risk and control of risk factors may be helpful in reducing morbidity and mortality associated with CVD. Individuals with AGA are more susceptible to CHD; hence screening people with AGA for CVD at a younger age may be suggested.

PARTICIPANTS AND METHODS

This cross-sectional study enrolled 200 patients (100 males and 100 females) aged between 50- 70 years. We chose patients who referred to Afshar Hospital (Yazd, Iran) during the year 2012. Inclusion criteria comprised: all patients with myocardial infarction, individuals who had undergone bypass surgery or angioplasty, and had at least 50% stenosis in one coronary vessel on angiography. The control group consisted of people with normal angiography results. Patients in both groups were examined and we determined the amount of hair loss. The Hamilton-Norwood grading for men and Ludwig scale for women were used to classify baldness^{10,11}.

RESULTS

From 200 people that participated in our study, half suffered from coronary artery disease (CAD); the other half consisted of normal individuals

defined as those who did not have a history of myocardial infarction, bypass surgery or angioplasty, and normal angiography results.

Table 1 shows the distribution of male baldness in the study and control groups. Among 50 men with CVD 92% experienced hair loss. This figure was 80% in the control group. Overall, no significant relationship existed between hair loss and CVD in men [odds ratio (OR): 2.87; *P*=0.148]. Chi-square analysis was used to evaluate and compare the severity of hair loss in both groups. A statistical significant association between the severity of hair loss and CAD existed in patients with CAD (*P*=0.038). A total of 74% of participants in this group had hair loss severity of grades IV-VIII, however in the control group, 50% had remarkable hair loss (Figure 1).

In the CHD group, 66% (32/50) of women had some degree of hair loss upon examination. In the control group, 46% had female pattern baldness (OR: 2.27; *P*=0.069). This finding showed a non-significant relationship between hair loss and CVD in women (Table 2). Unlike men, we did not observe any statistical significant association between the severity of hair loss and heart disease

Table 1. Distribution of male baldness in the study and control groups.

	Hair loss	No hair loss
	Frequency (%)	Frequency (%)
Control group	40 (80)	10 (20)
Study group	46 (92)	4 (8)

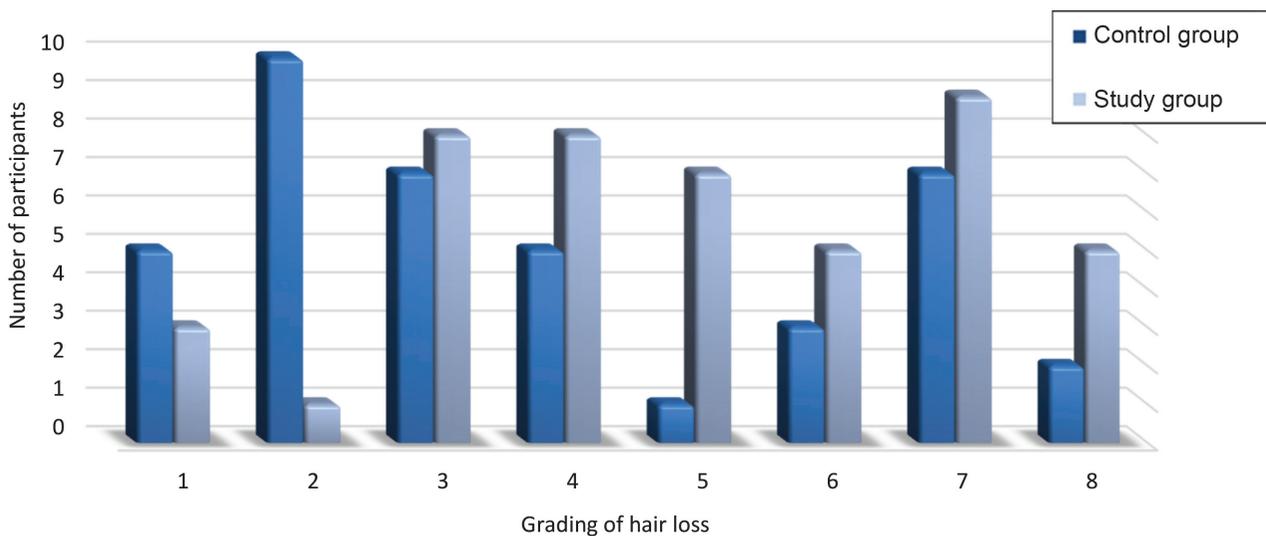


Figure 1. Comparison of male baldness severity in the study and control groups.

Table 2. Distribution of female pattern baldness in the study and control groups.

	Hair loss	No hair loss
	Frequency (%)	Frequency (%)
Control group	23 (46)	27 (54)
Study group	33 (66)	17 (34)

in women ($P=0.966$). Among female patients with CVD, 54.5% had grade I, 39.4% had grade II, and 6.1% had grade III hair loss. In the control group there were 47.8% of women with grade I hair loss, whereas 52.2% had grade II hair loss. None of the women had grade III hair loss (Figure.2).

DISCUSSION

Results of this study, as with other studies along this line, revealed a significant association between CAD and hair loss of grade IV onward. The current study, however, was unique because of the investigation on both men and women, and the use of angiography for selection of the control population.

Coronary heart disease is increasing daily and this disease is the most important cause of mortality. Accurate diagnosis of at risk people and control of risk factors may be helpful in decreasing complications. However because people with AGA appear to be at risk for CVD, it may be suggested that screening of people with AGA for CVD at a younger age may reduce the mortality rate of this disease¹².

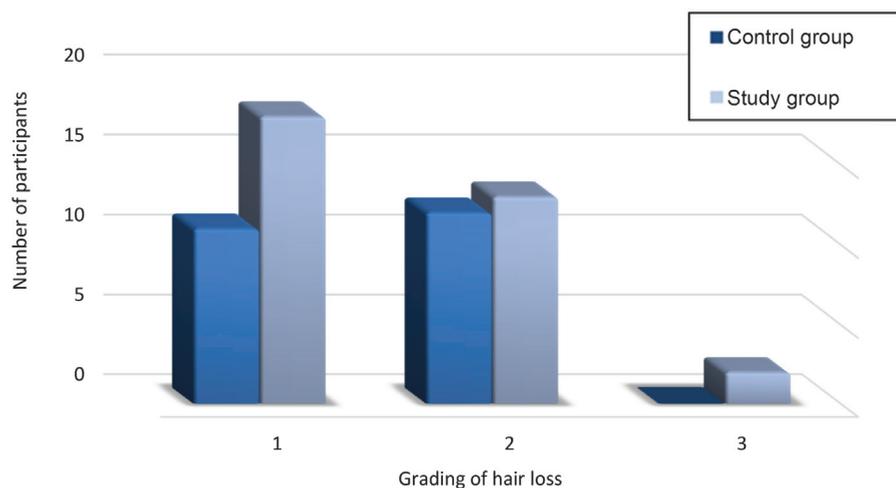
The major difference between our study and

previous studies was the simultaneous investigation on both men and women. Most surveys only studied males¹³⁻¹⁸. Mansouri *et al.* and Farajzadeh *et al.* only investigated females^{3,19}.

Among 200 patients in our study, there were 100 men and 100 women. We selected 100 patients without CAD and 100 patients with CAD. A study performed by Arias-Santiago *et al.* divided 154 patients into two groups of 77 subjects (40 males and 37 females) with or without AGA¹. Another study enrolled 50 men with AGA and 31 with normal hair growth¹³. In one study, Moravej *et al.* investigated 200 patients with CHD as defined by 50% stenosis in at least one of the large epicardial vessels. The control group comprised 200 people with normal angiography results (less than 50% stenosis in coronary vessels)¹⁵.

Both men and women were investigated simultaneously in two studies. Arias-Santiago *et al.* investigated the relationship between AGA and risk factors for CVD. Results of this study revealed that carotid ultrasound and metabolic syndrome assessment could be useful screening methods to detect the risk of developing CVD in male and female patients with early-onset AGA and signal a potential opportunity for early preventive treatment¹.

In a cohort study, Schnohr *et al.* studied 13000 males and females who initially had no evidence of CHD. During the 12-year follow up, 750 participants suffered from myocardial infarction. Schnohr *et al.* found a significant relationship between male baldness and myocardial infarction, however

**Figure 2.** Comparison of female baldness severity in the study and control groups.

this association was not statistically significant for women²⁰. Results of this study agreed with our investigation where we found a significant relationship between male baldness and CAD. In the current study, this association was not meaningful for women. However, in some studies that enrolled only females, the results differed compared to the current study.

Mansouri *et al.* studied the association between AGA and CVD in women. A total of 106 women under 55 years of age underwent coronary angiography. They suggested that female pattern hair loss was a possible risk factor for CHD³.

Farajzadeh *et al.* assessed lipid profiles in 82 people with or without female pattern alopecia. They concluded that lipid profiles, especially lipoprotein (a), were the most important risk factor for CAD. Thus, lipid profiles in women with female pattern hair loss should be investigated. In cases of abnormal test results, they should be referred to a cardiologist¹⁹.

Most previous studies have focused on this association in men. The majority have stressed that bald men are at higher risk for CHD compared to men who are not bald. Moravej *et al.* studied 400 men who underwent angiography procedures for diagnosis of CAD. They concluded that patients who have AGA grade III and above were at greater risk for CHD compared to people without AGA¹⁵.

Matilainen *et al.* investigated the relationship between early onset AGA and CVD. In this case-control study, 85 men who underwent coronary revascularization enrolled. Their results confirmed the relationship between early onset AGA and severe CHD¹⁴. Lotufo *et al.* evaluated the association between AGA and risk factors for CVD. The vertex type of AGA and CAD had the highest correlation¹⁶.

Although most studies supported the positive association between AGA and CVD, some investigations had results. Shahar *et al.* examined the relation of baldness pattern to carotid intimal-medial thickness. They suggested that male pattern baldness was not associated with elevated CHD risk¹⁸.

Although previous articles concluded that a relationship existed, but in some cases conflicting results were reported. In our study we observed a meaningful association between the severity of baldness and CAD in male patients ($P=0.038$) but this relationship did not exist among women with

hair loss. We enrolled 200 patients aged 50–70 years in this study, however most studies revealed that younger patients with severe early onset AGA have at higher risk of CHD. Hence, if we had considered younger people in our investigation, the results of this study would have been more practical, especially because age alone is a risk factor for CVD and in men CAD occurs at a younger age.

The $P=0.069$ suggested that if the sample size had been bigger, we could have detected a significant relationship between hair loss and CVD in women.

In conclusion, we observed a statistical significant association between severity of male baldness and CVD. However, this relationship was not observed among women with AGA. The latter finding contrasted other studies that focused on this association in women. As with most previous studies, we have suggested that the presence of AGA may help identify men at risk of CHD.

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