The Contribution of Endogenous and Exogenous Factors to Female Alopecia: A Study of Identical Twins

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Background: In this study, the authors investigated the potential contribution of environmental factors and testosterone levels on androgenic alopecia in women.

Methods: Ninety-eight identical female twins were recruited from 2009 to 2011. Subjects were asked to complete a comprehensive questionnaire, provide a sputum sample for testosterone analysis, and pose for standardized digital photography. Frontal, temporal, and vertex hair loss were assessed from the photographs using Adobe Photoshop. Hair loss measures were then correlated with survey responses and testosterone levels between twin pairs. Two independent, blinded observers also rated the photographs for hair thinning.

Results: Factors associated with increased frontal hair loss included multiple marriages ($p = 0.043$); longer sleep duration ($p = 0.011$); higher severity of stress ($p = 0.034$); positive smoking history ($p = 0.021$); higher income ($p = 0.023$); absence of hat use ($p = 0.017$); and history of diabetes mellitus ($p = 0.023$), polycystic ovarian syndrome ($p = 0.002$), and hypertension ($p = 0.001$). Factors associated with increased temporal hair loss included divorce or separation ($p = 0.034$), multiple marriages ($p = 0.040$), more children ($p = 0.005$), longer sleep duration ($p = 0.006$), and history of diabetes mellitus ($p = 0.008$) and hypertension ($p = 0.027$). Lack of sun protection ($p = 0.020$), consuming less caffeine ($p = 0.040$), history of skin disease ($p = 0.048$), and lack of exercise ($p = 0.012$) were associated with increased vertex hair loss. Higher testosterone levels were associated with increased temporal and vertex hair loss patterns ($p < 0.039$). Increased stress, increased smoking, having more children, and having a history of hypertension and cancer were all associated with increased hair thinning ($p < 0.05$).

Conclusion: This study implicates several environmental risk factors in the pathophysiology of female alopecia. (*Plast. Reconstr. Surg.* 130: 1219, 2012.)

Although androgenic alopecia predominately affects men, it is an affliction that affects up to 40 percent of adult women, and has an increased incidence at the onset of menopause.[1] Female hair loss can be sociologically and psychologically devastating, as full and luxurious hair is associated with femininity and beauty, with the converse being attributed to the elderly and unattractive.[2] In addition, androgenic alopecia causes a significant decrease in a woman's body image and adaptive functioning and is more psychologically distressing for women than for men.[3]

Female androgenic alopecia is a chronic progressive disease defined by dihydrotestosterone-induced miniaturization of hair follicles in individuals with higher androgen receptor and 5-α reductase concentrations in the scalp.[4,5] Unlike men, women with androgenic alopecia tend to retain their frontal hairlines but show significant thinning of the frontal/parietal scalp.[4] The only U.S. Food and Drug Administration–approved

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