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ORIGINAL ARTICLE

Non-Scarring Alopecia in Women Presenting with Hair Loss: Clinical Features and Influencing Factors

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Abstract

Background: This study aimed to evaluate the characteristics of non-scarring alopecia and the influencing factors in female patients presenting with hair loss.

Methods: A total of 213 female patients were included. Clinical diagnoses of telogen effluvium (TE), traction alopecia (TA), and androgenetic alopecia (AGA) were established. Laboratory evaluations included thyroid function (TSH, T4), vitamin and mineral levels (vitamin D, B12, folate), ferritin, and hemoglobin. Hair styling habits, headscarf use, and dermoscopic findings were also assessed.

Results: TE was the most prevalent type, observed in 75.6% of patients, with ferritin levels significantly associated with its presence. TA was identified in 41.8%, and its risk was significantly higher in individuals wearing headscarves ($p<0.05$), especially among those styling hair in tight buns or ponytails (OR: 26.65). TA severity correlated with the duration of headscarf use; individuals with ≥20 years of use demonstrated increased perifollicular erythema and loss of follicular openings, suggestive of chronic mechanical stress. AGA was detected in 31.4% of patients and was more common with advancing age. Most AGA patients had a positive family history. Dermoscopic features significantly associated with AGA included hair diameter variation, vellus hairs, and yellow dots.

Conclusion: In the assessment of non-scarring alopecia, both clinical and dermoscopic findings should be interpreted in light of individual lifestyle and cultural practices, which may play a contributory role in disease development and severity.

Keywords: Hair loss, dermoscopy, telogen effluvium, traction alopecia, androgenetic alopecia.

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INTRODUCTION

Hair loss in women should be considered not only as a cosmetic problem but also as an important health issue with psychosocial implications. Telogen effluvium (TE), androgenetic alopecia (AGA), and traction alopecia (TA), which belong to the non-scarring alopecias, are causes of hair loss that develop with different pathophysiological mechanisms but are frequently encountered in the clinic.

In the hair cycle of a healthy individual, approximately 84% of the hair is in the growth phase (anagen) and 10-15% is in the resting phase (telogen). There is also a catagen (transition) phase, but the number of hairs in this phase is small (1-2%).(1) Normally, a hair follicle produces hair in the anagen phase for about 4 years and then enters the telogen phase for about 4 months. As new anagen hairs begin to grow, they crowd out the resting telogen hairs, causing them to fall out.(2) In TE, a large proportion of hairs in the anagen phase suddenly switch to the telogen phase, causing hair loss. It is often associated with triggering factors such as medications, physiological and psychological stress, systemic diseases, nutritional deficiencies, or hormonal changes.(3) Clinically, patients usually present with diffuse and scattered hair loss, and in most cases the loss is reversible. (4) Although exact data on the incidence of TE in women vary, it is more common in the postpartum period, after acute stress, and in association with chronic diseases.(3)

Androgenetic alopecia is a prevalent form of chronic hair loss among women, with a genetic predisposition, decreased estrogen levels, and androgens identified as contributing factors.(5) This condition, also known as female pattern hair loss (FPHL), is characterized by a reduction in hair density in the vertex region, while the anterior hairline remains intact.(6) Its prevalence among women increases with age, and studies have shown a rise from 12% in late 20s to 30% in the 30s and over 50% in the 80s.(7)

Traction alopecia is a form of hair loss that develops as a result of prolonged and repetitive mechanical stress on the hair follicles.(8) While this form of hair loss is initially reversible, it transforms into scarring alopecia in the chronic phase.(9) It can be caused by tight braids, ponytails, hair extensions, and hair styling practices such as chemical treatments and heat. Consequently, its prevalence may be disproportionately high among certain ethnic groups due to the influence of religious and cultural practices.(10)

In this study, we investigated the prevalence and characteristics of non-scarring alopecia in women and evaluated TE, AGA, and TA. Scarring alopecia, such as discoid lupus erythematosus, lichen planopilaris, and frontal fibrous alopecia, were not included in the study. In addition, alopecia areata(AA), a distinct form of non-scarring alopecia with an autoimmune etiology primarily involving a T-cell mediated attack on hair follicles, was excluded from this study. As the autoimmune pathogenesis of AA is well established, the inclusion of such cases could have introduced heterogeneity into the study population due to their unique pathophysiology, cytokine profile, and treatment response.(11) Therefore, to maintain a more uniform sample and to ensure the validity of the comparative analyses, patients with AA were not included in this investigation. The objective of this study is to enhance our understanding of the prevalence and associated risk factors of non-scarring alopecia in women.

MATERIALS AND METHODS

The present study was conducted at the Dermatology Clinic of Ankara Etlik City Hospital from June 2024 to January 2025. Female patients over the age of 18 who presented with hair loss and were subsequently diagnosed with non-scarring alopecia during this period were included in the study. Sociodemographic characteristics such as age, gender, education, occupation, smoking, and alcohol use were recorded. The patients' hair loss types were determined, and comorbidities, possible triggering factors, and scalp symptoms were documented. Disease-specific severity scales, if available, were utilized according to the hair loss types of the patients.

The Marginal Traction Alopecia Severity (M-TAS) score was used for patients diagnosed with TA. In this scoring system, the anterior and posterior hairlines are anatomically divided into three zones each: the anterior hairline into right temporal, left temporal, and intertemporal regions; the posterior into right mastoid, left mastoid, and intermastoidal regions. Normal areas score 0. If short or thin hair covers less than 50% of the region, it scores 1 point; more than 50%, 2 points. If alopecic areas are

less than 50% of the region, they score 3 points; more than 50%, 4 points. The maximum possible score is 12 for each hairline, totaling 24 points.(12)

The Ludwig classification was employed to evaluate the severity of AGA. This system divides hair loss in the anterior and vertex regions into three types. Type I (mild): preserved frontal hairline with minimal vertex thinning; Type II (moderate): reduced density and widened parting line; Type III (severe): advanced thinning with visible scalp. The frontal and vertex areas were clinically evaluated and categorized accordingly. (13) The evaluation entailed a clinical examination of the patients' hair density in the frontal and vertex regions, with the severity of hair loss being determined and classified according to the Ludwig scale.

Each patient underwent a dermoscopic examination to assess findings including decreased hair density, vellus hairs, hair diameter variability, empty follicles, loss of follicular openings, yellow dots, perifollicular erythema, broken hairs, black dots, round hairs, branching red vessels, comma-shaped hairs, and curly hairs. All findings were recorded systematically.

Patients were examined for thyroid function (TSH, free T4), vitamin and mineral levels (vitamin D, B12, folate), iron deficiency (ferritin) and hematologic parameters (hemoglobin). These biochemical parameters were analyzed to assess their association with hair loss and related systemic factors. According to the reference ranges of our hospital laboratory, TSH was considered normal between 0.4–4.2 μIU/mL, free T4 between 0.9–1.7 ng/dL, ferritin ≥13 ng/mL, vitamin B12 ≥197 pg/mL, vitamin D ≥30 ng/mL, and hemoglobin between 12–16 g/dL.

Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was assessed using the Shapiro-Wilk test. Variables with normal distribution were expressed as mean ± standard deviation (SD), while those without normal distribution were expressed as median (minimum–maximum). Categorical variables were presented as numbers and percentages (%).

For comparisons between groups, the independent samples t-test was used for normally distributed continuous variables, and the Mann–Whitney U test was applied for non-normally distributed variables. The chi-square test was used to assess relationships between categorical variables. To evaluate risk factors, logistic regression analysis was performed, and odds ratios (ORs) with 95% confidence intervals (CIs) were reported. Spearman correlation analysis was used to assess relationships between continuous variables. A p-value < 0.05 was considered statistically significant for all analyses.

The study was approved by the Ethics Committee of Ankara Etlik City Hospital with the number AEŞH-BADEK-2024-588, and all procedures were performed in accordance with the ethical principles of the 1964 Declaration of Helsinki.

RESULTS

The present study included 213 female patients who presented with complaints of hair loss. The mean age of the participants was 30.27 ± 11.82 years (median: 26.00, range: 18–72), and the mean body mass index (BMI) was 24.11 ± 4.82 kg/m² (median: 23.23, range: 14.69–50.78). The mean duration of active hair loss was 25.30 ± 32.23 months. Of the 213 patients, 38.5% had only TE, 13.1% had only TA, and 9.4% had only AGA. Additionally, 38.9% of the patients were diagnosed with two or more types of non-scarring alopecia. The detailed distribution is presented in Table 1.

Among the participants, 95 patients reported no scalp symptoms, while 104 patients complained of pruritus, 14 reported headache, 7 had trichodynia, and 4 described paresthesia. On scalp examination, 55 patients were found to have seborrheic dermatitis, 75 patients had dandruff, and 5 had scalp acne, whereas 118 patients presented with no additional dermatological findings.

A family history of hair loss was reported by 104 patients, and 20 patients had a family history of seborrheic dermatitis. Additionally, 31 patients had previously received treatment for hair loss.

Regarding potential triggering factors, 55 patients did not report any known triggers, while 151 patients (70.9%) identified stress as a contributing factor. Other reported triggers included infection in 7 patients, surgical intervention in 11 patients, and medication use in 14 patients.

In addition to clinical and systemic factors, hair-related characteristics and daily hair styling practices—both of which may play a role in the development or exacerba-

Table 1. Distribution of Alopecia Diagnoses Among Patients (N = 213)

Diagnosis Combination	Number of Patients (n)	Percentage (%)
TE only	82	38.5
TA only	28	13.1
AGA only	20	9.4
TE + TA	36	16.9
TE + AGA	22	10.3
TA + AGA	4	1.9
TE + TA + AGA	21	9.9
Total	**213**	**100**

TE: Telogen Effluvium, TA: Traction Alopecia, AGA: Androgenetic Alopecia

tion of alopecia—were also assessed. These findings are detailed in Table 2.

Among the 195 patients with vitamin D deficiency (< 30 ng/mL), 146 (74.8%) were diagnosed with TE. All eight patients with abnormal thyroid function tests (low TSH in 1, elevated TSH in 7) exhibited TE, although none had clinically confirmed hypo- or hyperthyroidism. Due to the small sample size, a conclusive relationship could not be established.

Ferritin levels <13 ng/mL were identified as a significant risk factor for TE: among 39 patients, 37 (94.8%) had TE (p = 0.007, OR = 7.45). However, vitamin B12 deficiency (present in 11 patients, 9 with TE) and low hemoglobin (26 patients, 21 with TE) did not demonstrate a statistically significant association with TE. Similarly, although vitamin D deficiency was prevalent, it was not found to be a significant predictor.

Only 3 out of 161 TE patients (1.86%) had entirely normal laboratory findings. Among these, all had experienced psychological stress, with one patient also reporting previous infection and one reporting medication use as a possible trigger. While TE was common across groups, no significant difference in TE incidence was observed between headscarf wearers and non-wearers. Detailed laboratory and clinical associations are presented in Table 3.

A total of 89 patients (41.78%) were diagnosed with traction alopecia (TA), with M-TAS scores ranging from 1 to 16. The mean severity score was 3.97 (±2.93), and the median score was 3 (IQR: 2–6). Among patients with TA, 73 (82.0%) reported headscarf use, with a mean duration of 14.39 years. Evaluation of hair-tying practices revealed that 2 patients (2.74%) did not tie their hair, 11 (15.07%) styled their hair in a low bun, 10 (13.70%) in a low ponytail, 40 (54.79%) in a high bun, 4 (5.48%) in a high ponytail, and 6 (8.22%) secured it loosely using a claw clip. Among the 16 patients (17.9%) with TA who did not wear a headscarf, 11 (68.8%) preferred buns, 4 (25.0%) ponytails, and 1 (6.3%) used a claw clip. One patient (6.25%) wore her hair untied, 9 (56.25%) in ponytails, 4 (25.00%) in buns, and 2 (12.50%) with a claw clip.

A statistically significant difference in TA prevalence was found between patients who wore headscarves and those who did not *(p <0.05)*. Among all participants, 28 (13.1%) did not tie their hair, and only 1 (3.6%) had TA. In contrast, 146 patients (68.5%) tied their hair in a bun or ponytail, and 77 of them (52.7%) had TA. TA was ob-

Table 2. Hair Characteristics and Headscarf Usage	
	N (%)
Hair Length	**N= 185**
<10 cm	2 (0,94%)
11-20 cm	30 (14,08%)
21-30 cm	74 (34,74%)
31-40 cm	53 (24,88%)
>40 cm	54 (25,35%)
Hair Styling Habits	**N= 185**
Does not tie	28 (13,15%)
Ponytail	39 (18,31%)
Bun	107 (50,23%)
With claw clip	39 (18,31%)
Daily Hair Tying Duration (hours)	**N= 185**
1-3	38 (%20,54%)
4-6	33 (%17,84%)
7-9	35 (%18,92%)
10-12	21 (%11,35%)
13-16	24 (%12,97%)
17-20	14 (%7,57%)
21-24	20 (%10,81)
Number of patients using headscarf	**95 (%44,6)**
Average duration of use (years)	**14,68**
Daily Headscarf Duration (hours)	**N=95**
0-3	34 (35,79%)
4-6	19 (20,00%)
7-9	16 (16,84%)
10-12	18 (18,95%)
13-16	8 (8,42%)
17-24	0 (0,00%)
Use of Bonnet	**N=95**
Yes	88 (92,63%)
No	7 (7,37%)
Hair Styling Under Headscarf	**N=95**
Does not tie	4 (4,21%)
Low bun	16 (16,84%)
Low ponytail	12 (12,63%)
High bun	48 (50,53%)
High ponytail	9 (9,47%)
With claw clip	6 (6,32%)

Table 3. Evaluation of Factors Associated with Telogen Effluvium (TE)

Factor	Factor (+) TE (+)	Factor (+) TE (-)	Factor (-) TE (+)	Factor (-) TE (-)	OR (Odds Ratio)	*P*
Vitamin D deficiency	146	49	15	3	0.59	0.42[a]
Thyroid dysfunction	8	0	153	52	NaN	0.022[a]
Ferritin <13 ng/mL	37	2	124	50	**7.45**	**0.007[a]**
Ferritin <40 ng/mL	109	33	52	19	1.20	0.573[b]
Ferritin <70 ng/mL	144	47	17	5	0.9	0.845[a]
Vitamin B12 deficiency	9	2	152	50	1.48	0.672[a]
Low hemoglobin	21	5	140	47	1.41	0.513[a]
History of infection	7	0	154	52	NaN	0.267[a]
Surgical history	10	1	151	51	3.38	0.251[a]

[a]*Fisher's Exact test was used*
[b]*Chi-square test was used.* TE: Telogen Effluvium, NaN:undefined

served in 11 of 39 patients (28.2%) who used a claw clip. Not tying the hair was associated with a significantly lower risk of TA *(p <0.05)*.

Hair-tying style was the strongest risk factor for TA (OR: 26.65, 95% CI: 3.53–201.05, *p<0.05)*. While headscarf use was also significantly associated with TA, it conferred a lower risk compared to hair-tying practices (OR: 21.15, 95% CI: 10.39–43.05, *p<0.001)*.

Among 88 patients who used an inner cap (bonnet), 68 (77.3%) had TA, compared to 5 of 7 (71.4%) who did not. However, bonnet use did not significantly increase the risk (OR: 1.36, 95% CI: 0.22–8.18, *p = 0.75)*.

Notably, duration of headscarf use was significantly correlated with TA severity *(p <0.05)*, while hair-tying style, hair length, and daily headscarf duration did not significantly affect severity *(p>0.05)*. Patients with ≥20 years of headscarf use had significantly higher M-TAS scores than those with <20 years *(p<0.05)*.

Androgenetic alopecia was diagnosed in 67 patients (31.45%). Based on clinical severity, 48 patients (71.64%) were classified as Ludwig stage I, and 19 patients (28.36%) as stage II. No patients were identified with Ludwig stage III. The frequency of AGA increased with age: 26.4% in patients under 30 years, 36.8% in those aged 30–40, 50% in patients aged 40–50, and 68.42% in those over 50 years. A positive family history of AGA was recorded in 64.17% (n = 43) of patients.

The most common dermoscopic finding was decreased hair density, observed in all patients (100%). Vellus hairs were present in 162 patients (76.1%), and hair diameter variability was noted in 183 patients (85.9%). Empty follicles were seen in 125 patients (58.7%), and loss of follicular patency was recorded in 19 patients (8.9%). Yellow dots were detected in 62 patients (29.1%), perifollicular erythema in 24 patients (11.3%), broken hairs in 28 patients (13.1%), and black dots in 7 patients (3.3%). Less frequent findings included round hairs (0.9%), branching red vessels (5.6%), and comma or coiled hairs (0.5%). The distribution of dermoscopic findings by disease is shown in Table 4.

Table 4. Distribution of Trichoscopic Findings by Diagnosis

Finding	TE (n=82)	TA (n=28)	FAGA (n=20)	TE+TA (n=36)	TE+AGA (n=22)	TA+AGA (n=4)	TE+TA+ AGA (n=21)	Total (n=213)
Decreased Hair Density	82	28	20	36	22	4	21	213
Vellus Hairs	49	21	20	28	19	4	21	162
Hair Shaft Diameter Diversity	64	20	20	32	22	4	21	183
Empty Follicles	41	17	12	20	16	3	16	125
Loss of Follicular Openings	1	6	2	3	2	0	5	19
Yellow Dots	9	7	8	9	16	1	12	62
Perifollicular Erythema	0	5	0	6	7	1	5	24
Broken Hairs	6	2	4	7	1	0	8	28
Black Dots	3	1	1	0	0	0	2	7
Circle Hairs	1	0	0	0	1	0	0	2
Branched Red Vessels	1	1	1	3	3	0	3	12
Comma and Coiled Hairs	1	0	0	0	0	0	0	1

TE: Telogen Effluvium, TA: Traction Alopecia, AGA: Androgenetic Alopecia

To better understand the disease-specific dermoscopic findings, the primary analysis was conducted on patients with a single diagnosis (TE only, TA only, or AGA only) In this analysis, vellus hairs ($p = 0.006$), hair diameter variability ($p = 0.009$), and yellow dots ($p = 0.032$) were significantly associated with AGA. Additionally, perifollicular erythema ($p = 0.024$) and loss of follicular patency ($p = 0.045$) were significantly more common in TA. These associations suggest that dermoscopic features can serve as supportive diagnostic tools, particularly in distinguishing between AGA and TA, and may provide insight into the chronicity and underlying mechanisms of each condition.

Since mixed alopecia types are frequently encountered in clinical practice, a secondary analysis including patients with multiple diagnoses was also performed. In this analysis, similar dermoscopic patterns were observed, but the statistical significance of most associations diminished, likely due to overlapping features among different alopecia types. This indicates that dermoscopy may be most diagnostically useful in patients with a single predominant form of alopecia.

Among patients diagnosed with TA (including both isolated and combined diagnoses), perifollicular erythema and follicular patency loss were significantly more common in those who had worn a headscarf for more than 20 years *($p<0.05$)*. However, no significant association was found between headscarf duration and other dermoscopic findings.

DISCUSSION

The most prevalent form of hair loss identified in our study was found to be TE, with TA and AGA manifesting at decreasing frequencies. The most salient laboratory parameter that augmented the risk for TE was identified as low ferritin. Although the use of a headscarf increased the risk of TA, the strongest associated factor was tight hair-tying methods. This phenomenon may be indicative of cultural norms surrounding headscarf usage, particularly within the study population, where individuals often employ tight hairstyling techniques.

Telogen effluvium, a well-known cause of hair loss, is characterized by the loss of hair beyond what would be expected based on the patient's age and gender. However, the true frequency of this condition remains uncertain.(2) Our study identified TE as the most prevalent cause of hair loss in the study group. For patients diagnosed with TE, it is recommended that basic screening procedures include complete blood count, ferritin level, and TSH control.(4) Numerous studies have demonstrated the impact of iron deficiency on TE.(14,15) It has been demonstrated that iron supplements, even in the absence of iron deficiency, enhance patient satisfaction regarding hair loss.(16) It is advised to persist in iron treatment until ferritin levels surpass 70 ng/mL.(4,17) In our study, no increase in TE risk was found in patients with ferritin levels below 70 ng/mL or 40 ng/mL, while ferritin levels below 13 ng/mL were found to significantly increase the risk of TE. This finding suggests that iron deficiency may be effective in the development of TE when it falls below a certain threshold value. The heterogeneity of threshold values reported in studies conducted on diverse populations suggests that the impact of iron deficiency on TE may be contingent on individual and environmental factors. Although TE was observed in all patients with thyroid dysfunction in our study, this association was not statistically significant due to the limited number of cases. However, this observation indicates that impaired thyroid function may directly impact the hair cycle and potentially contribute to the pathogenesis of TE. The existing literature also suggests a link between endocrine disorders, such as hypothyroidism and hyperthyroidism, and hair loss.(11) Consequently, we hypothesize that evaluating thyroid function in patients with TE may help identify systemic causes. However, current evidence remains insufficient to support the hypothesis that deficiencies in vitamin B12, folic acid, riboflavin, or zinc are causative factors for TE.(18) In our study, consistent with the existing literature, no significant association was observed between B12 and folic acid deficiencies and TE.

It is well established that TA results from prolonged tension applied to the hair roots. Notably, the literature includes a case of traction alopecia in a 17-year-old female patient, attributed to the weight of excessively long hair.(19) In our patient cohort, hair length was not found to be an independent risk factor for TA. Cultural, religious, and occupational practices influencing hair-tying styles have also been recognized as contributors to TA development.(10) In addition to genetic susceptibility observed in African populations, the presence of curly and fragile hair may increase vulnerability to mechanical tension, thereby heightening the risk of TA. Studies have shown that TA affects approximately one-third of African women. Moreover, hairstyling practices that increase both tension and weight—such as tight braids and hair extensions—have been demonstrated to significantly elevate the risk of TA.(9,20,21) However, a study conducted in London with individuals of African origin found this frequency to be 1%.(22) These findings suggest that environmental and cultural hair practices influence hair habits more than ethnicity.

In the present study, TA was identified in 41% of the participants, which may be partially explained by the high proportion (44.6%) of headscarf-wearing individuals in the sample. The religious and cultural practices prevalent in the region where the study was conducted likely influenced this finding. However, it is important to emphasize that this figure pertains only to patients presenting to a dermatology outpatient clinic with hair loss complaints and may not accurately reflect the overall prevalence of TA in the general population. In a study conducted in the USA with Muslim women of Indian and Bangladeshi origin, 125 patients who were wearing headscarves were compared with 40 patients of the same ethnicity who did not wear headscarves. The study found that TA was detected in only 10 (10.4%) of the patients who were wearing headscarves, and no sig-

nificant difference was found in terms of TA frequency when compared with patients who did not wear headscarves.(23) Our study found that the use of a headscarf was associated with increased TA risk, with the primary contributing factor being the way the hair is tied underneath the scarf. This phenomenon is believed to be culturally influenced, reflecting the unique practices surrounding headscarf use in our country. Tight hairstyles and the use of an under-scarf bonnet are particularly common. Therefore, it is recommended that individuals who habitually tie their hair tightly consider opting for looser hairstyles or alternatively leaving their hair unbound at regular intervals. Furthermore, while the use of a bonnet alone does not result in an increase in TA, educating patients about the tension caused by tight hair ties may help prevent TA.

Prevalence studies conducted in the UK, USA, Australia, and China report varying results (5.6%-38%) for TA in the literature; however, these rates pertain to the general population and may not accurately reflect the distribution among patient groups seeking care at health institutions.(24) In our study, AGA was detected in 31.45% of patients presenting with hair loss. While this rate cannot be directly compared with the prevalence in the general population, it underscores the significance of AGA in patient groups seeking care at dermatology clinics. Notably, AGA patients in our study were predominantly in the early stages, suggesting that young patients are often diagnosed at the Ludwig I level and seek dermatological evaluation before reaching more advanced stages. Furthermore, our study noted a significant increase in the frequency of AGA with age. This finding supports the progressive nature of the disease and appears to be consistent with previous literature. (7) AGA may occur due to the effects of genetic, hormonal, and environmental factors. Family history has been reported as 50%.(5) In our study, the proportion of patients with a positive family history (64%) is high, indicating that genetic predisposition is an important factor.

In this study, dermoscopy proved to be a valuable tool in distinguishing between different types of non-scarring alopecia.

Among patients with a single diagnosis, vellus hairs, hair shaft diameter variability, and yellow dots were significantly associated with AGA, in line with findings from previous studies that highlight these features as core trichoscopic markers of androgenetic alopecia. (25,26) These parameters reflect the miniaturization process and heterogeneity in hair shaft thickness characteristic of AGA. Similarly, perifollicular erythema and follicular opening loss were significantly more common in patients with TA, including those with isolated and combined diagnoses, supporting the role of chronic mechanical tension and localized inflammation in TA pathogenesis. Although perifollicular erythema is generally considered a hallmark of early-stage TA, its persistence in patients with long-term headscarf use (over 20 years) may indicate chronic ongoing stress and unresolved follicular injury.(27)

The inclusion of patients with combined diagnoses in a secondary analysis reflects real-world clinical complexity but resulted in a dilution of statistical significance. This outcome emphasizes that overlapping trichoscopic features may limit diagnostic specificity when multiple alopecia types coexist, and thus dermoscopic interpretation should always be considered within the broader clinical context.

These findings underscore the importance of integrating clinical history, hairstyling practices, and trichoscopic evaluation, particularly in populations with cultural or religious hair-covering habits. Chronic scalp stress, as seen in prolonged headscarf use, may play a pivotal role not only in the development of TA but also in the severity and inflammatory profile of the condition

This study has several limitations that should be considered when interpreting the findings. First, as the study population consisted solely of individuals who presented to a dermatology clinic with complaints of hair loss, the results may not accurately represent the overall prevalence or characteristics of hair loss in the general population. Consequently, generalizing these findings beyond the studied cohort should be approached with caution. Second, given that TA is closely influenced by cultural and social practices, the findings may reflect the unique sociocultural context of the study setting, thereby limiting comparability with results from other geographic or cultural populations. Finally, in evaluating AGA, only family history was assessed, whereas other

contributing hormonal, metabolic, or environmental factors were not examined. This represents a methodological limitation that may have hindered a comprehensive understanding of the multifactorial nature of AGA.

Telogen effluvium demonstrated the strongest correlation with low ferritin levels, thereby underscoring the pivotal role of iron status in its etiology. TA manifested at a significantly higher frequency among female subjects who wore headscarves, a phenomenon likely attributable to the recurrent necessity of securing their hair. Among all evaluated factors, tight hairstyling practices—particularly buns and ponytails—were identified as the most salient risk factor for TA. Educational initiatives targeting these hairstyling habits may contribute to a reduction in TA prevalence, particularly in populations where headscarf use is prevalent.

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Abbreviations List

AA: alopecia areata
AGA: androgenetic alopecia
BMI: body mass index
CIs: confidence intervals
FPHL: female pattern hair loss
M-TAS: Marginal Traction Alopecia Severity score
ORs: odds ratios
SD: standard deviation
TA: traction alopecia
TE: telogen effluvium
TSH: thyroid-stimulating hormone

Ethics Approval and Consent to Participate

The study was approved by the Ethics Committee of Ankara Etlik City Hospital with the number AEŞH-BADEK-2024-588, and all procedures were performed in accordance with the ethical principles of the 1964 Declaration of Helsinki.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets generated and analyzed during the current study are not publicly available due to patient confidentiality restrictions but are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that there is no conflict of interest.

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