Postpartum Telogen Effluvium Unmasking Additional Latent Hair Loss Disorders

by SARA AHMED GALAL, MD; SAWSAN KHALIFA EL-SAYED, MD; and MANAR MOHAMED HASAN HENIDY, MBBCh

Drs. Galal and El-Sayed are with the Dermatology and Venereology Department and Faculty of Medicine at Al-Azhar University in Cairo, Egypt. Dr. Henidy is with the Faculty of Medicine at Al-Azhar University in Cairo, Egypt.

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OBJECTIVE: We sought to detect additional underlying hair loss disorders in patients with postpartum telogen effluvium. **METHODS:** We completed clinical and dermoscopic evaluations on 200 female participants experiencing postpartum hair loss. **RESULTS:** 9.5 percent of patients were diagnosed with telogen effluvium (TE), 56.0 percent patients were diagnosed with TE with androgenetic alopecia (AGA), 6.5 percent patients were diagnosed with TE and TA, and 28.0 percent patients were diagnosed with TE, AGA, and TA. In the central area, patients with TE displayed upright regrowing hair and single pilosebaceous unit in 100 percent and 94.7 percent of patients, respectively. While patients with TE and AGA, displayed upright regrowing hair, single pilosebaceous unit, and hair diameter diversity greater than 20 percent. In patients diagnosed with TE and TA, the trichoscopic findings were similar in the TE group to the patients diagnosed with TE, AGA, and TA were also similar to the patients with TE and AGA. Regarding the area of traction, there was no difference observed between the patients with TE and TA and patients with TE, AGA, and TA. The frequent findings were hair diameter diversity, empty follicles, and vellus hair. **CONCLUSION:** Postpartum TE may be associated with other hair loss disorders. Awareness of this is critical to appropriate diagnosis and treatment. **KEYWORDS:** Telogen effluvium, postpartum, female androgenetic alopecia, traction alopecia

Telogen effluvium (TE) is a type of diffuse hair shedding that is not associated with scarring or inflammation and is usually triggered by physiological or emotional stress.[1] TE can be classified as acute (lasting less than six months) or chronic (lasting more than six months).[2] The hallmark feature of TE is excessive shedding of telogen or resting hair, which typically occurs 2 to 3 months after exposure to a trigger. Hair regrowth is expected once the underlying stressor is removed.[3] In normal individuals, the scalp contains approximately 85 percent anagen and 15 percent telogen hair, whereas in TE, up to 30 percent of hair follicles shift to telogen, leading to significant hair loss.[4] The exact prevalence of TE is unknown, but it can occur in individuals of any age, gender, or race, with women being more commonly affected due to postpartum hormonal changes.[5]

Pregnancy and the postpartum period are associated with hormonal changes that can affect hair cycling. During pregnancy, a prolonged anagen phase is observed due to the effects of progesterone, which increases hair shaft diameter and inhibits androgen secretion leading to anagen maintenance. After delivery, progesterone levels decrease, while prolactin levels increase, leading to premature induction of catagen and simultaneous entry into the telogen phase, resulting in increased shedding of telogen hair.[6]

Regular clinical and trichoscopical examinations are very important for evaluating various types of hair loss. Trichoscopy is a non-invasive technique used to visualize hair shafts, hair follicle openings, and perifollicular epidermis.[7]

The postpartum period is defined as the 6 to 8 weeks following delivery.[8] Excessive hair shedding during this period may reveal other underlying hair loss disorders.[9] Therefore, the aim of our study was to detect how postpartum TE can unmask underlying hair loss disorders, such as female androgenetic alopecia and traction alopecia.

METHODS

Patients. This observational, descriptive, cross-sectional, non-interventional study included two hundred female patients experiencing postpartum hair loss. They ranged in age from 20 to 38 years. All patients were enrolled from a dermatology outpatient clinic of our university hospital over a period from April 2022 to February 2023. The study was conducted following approval of the research ethical committee of the faculty of medicine. Consent was acquired from all patients.

This study included postpartum female patients 6 to 8 weeks after delivery. We excluded patients with autoimmune and systemic diseases, patients on drugs that cause hair loss, such as anticonvulsants,

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CORRESPONDENCE: Sara Galal, MD; Email: drsaragalal@azhar.edu.eg

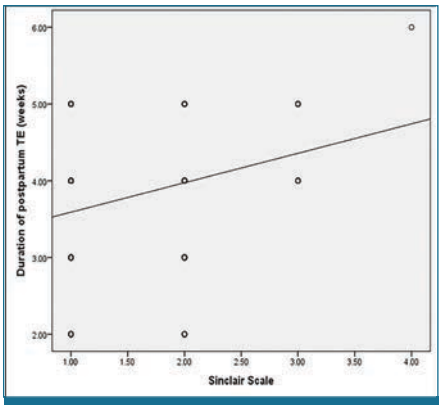

FIGURE 1. Scatter plot between duration of postpartum TE (weeks) and Sinclair Scale among study group

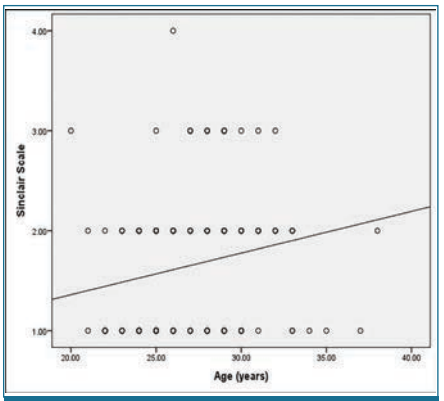

FIGURE 2. Correlation between age (years) and Sinclair Scale

antidepressants, and beta-blockers, for a duration beyond three months, patients with heat-treated hair, and patients with scalp or hair disorders, such as tinea capitis and alopecia areata. History was collected for all patients, which included the following information:

- Age, number of pregnancies, socioeconomic status, special habits, type of delivery (Caesarean section or vaginal), lactation type, and post-labor complications
- Present illness, including onset and duration of postpartum telogen effluvium, pattern of hair loss (shedding or thinning) and if there is hair traction, scalp burning or itching, or trichodynia
- History of acne, hirsutism, polycystic ovary syndrome, or menstrual irregularities
- History of systemic or autoimmune diseases
- History of drug intake as oral hormonal contraception or drugs for any medical problem
- Family history of any hair disease

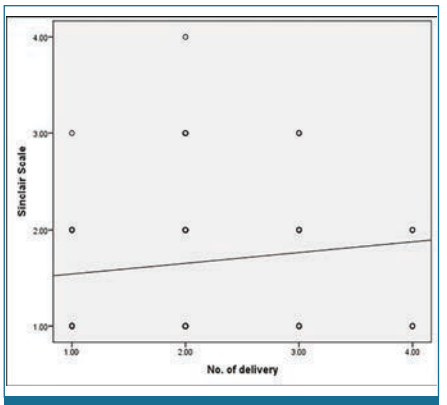

FIGURE 3. Scatter plot between number of pregnancy and Sinclair Scale among study group

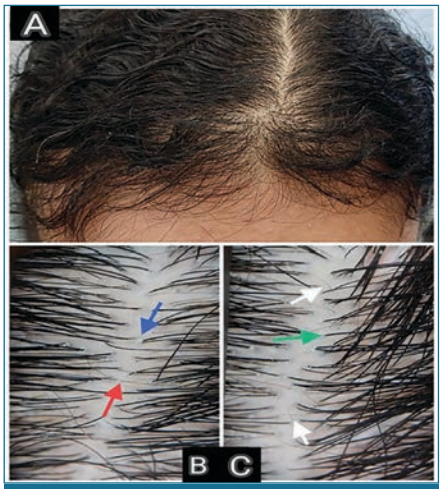

FIGURE 4. (A). 26-year-old female patient with postpartum TE, Sinclare Scale grade I. (B, C). Trichoscopic photos of the central area showing upright regrowing hair (white arrow), single pilosebaceous unit(green arrow), hair diameter diversity (red arrow) and perifollicular scales (blue arrow) which is consistent with TE. Diagnosis: TE

General examinations were performed to exclude associated systemic diseases. A dermatological examination was performed to identify any skin disease and scalp or hair disorders. Hair pull test was performed by grasping about 60 hairs between the thumb and fingers then pulling gently but firmly from root to tip. Patients were asked to refrain from shampooing for 24 hours before examination.[10]

Clinical evaluation of all patients was done using Sinclair scale grading, as follows: Grade 1 is normal. Grade 2 shows a widening of the central part. Grade 3 shows a widening of the central part and thinning of the hair on either side of the central part. Grade 4 reveals the emergence of a diffuse hair loss over the top of the scalp. Grade 5 indicates advanced hair loss.[11]

Trichoscopic examination. A noncontact polarized dermoscopy (Dermlite HUD, the USA made, 2016 by 3GEN INC) connected to SAMSUNG Galaxy A52s 5G with 64 Megapixels camera and magnification power x10 was used to evaluate trichoscopic findings of telogen effluvium and other underlying hair loss disorders such as FAGA or TA.

Evaluation of the patients. Photographs of the hair were taken clinically from both central area and area of traction if present from a 20cm distance by SAMSUNG Galaxy A52s 5G with 64 Megapixels camera & magnification power (x10). The most common sites of traction are the frontal and temporoparietal areas, although any area of the scalp can be affected. Trichoscopic evaluation of both central area and area of traction if present to detect underlying hair disorders.

Statistical analysis. Data were collected, revised, coded, and entered into the Statistical Package for Social Science using SPSS Inc.'s, version 20.0 (Chicago, Illinois). Mean, standard deviation (SD) and ranges were used to express quantitative data, while numbers and percentages were used to express qualitative data. The confidence interval was set to 95 percent, and the margin of error accepted was set to 5 percent. So, the *P*-value was considered significant as the following: *P*-value >0.05: nonsignificant (NS); *P*-value <0.05: significant (S); and *P*-value <0.001: highly significant (HS).

RESULTS

This observational, descriptive, cross-sectional study was conducted on 200 female patients experiencing postpartum telogen effluvium. The age of the studied patients ranged from 20 to 38 years with a mean SD 26.96±3.10 years. The number of pregnancies ranged from 1 to 4 (median=2). Demographic data and characteristics of the study participants are listed in Table 1.

Clinical examination of the studied patients. The clinical examination of the studied patients showed that all patients (N=200, 100%) had a positive hair pull test. As for the Sinclair Scale, 89 patients (44.5%) were Class I, 93 patients (46.5%) were Class II, 17 patients (8.5%) were Class III and one patient (0.5%) was Class IV (Table 2).

Diagnosis of the studied patients. The diagnosis of the studied patients was as follows: 19 patients (9.5%) were diagnosed as TE, 112

TABLE 1. Demographic data and characteristics of the studied patients

DEMOGRAPHIC DATA	TOTAL (N=200)
Age (years) [Range (Mean ±SD)]	[20-38 (26.96±3.10)]
Pregnancies [Range: Median]	[1-4: 2]
Socioeconomic status, n (%)	
Low	17 (8.5%)
Moderate	183 (91.5%)
Special habits	0 (0.0%)
Type of Labor (CS or vaginal), n (%)	
CS	142 (71.0%)
Vaginal	58 (29.0%)
Lactation Type, n (%)	
Breast	168 (84.0%)
Formula-fed	32 (16.0%)
Post labor Complications	0 (0.0%)
HX of Systemic Disease	0 (0.0%)
Trichodynia	88 (44.0%)
FHx of any hair disease, n (%)	
AGA	163 (81.5%)
Seborrheic Dermatitis	2 (1.0%)
No	35 (17.5%)
Acne	65 (32.5%)
Hirsutism	24 (12.0%)
PCO	13 (6.5%)
Menstrual disturbance	14 (7.0%)
Hx of Hair traction, n (%)	
Negative	131 (65.5%)
Positive	69 (34.5%)
Site of hair traction, n (%)	
Frontal	17/69 (24.6%)
Frontal & Temporal	8/69 (11.6%)
Temporal	44/69 (63.8%)
Onset of postpartum TE (weeks) [RANGE (Mean ±SD)]	1-4 [2.95±0.80]
Duration of postpartum TE (weeks) [RANGE (Mean ±SD)]	2-6 [3.84±0.89]
Pattern of hair loss, n (%)	
Shedding	32(16.0%)
Shedding & Thinning	168(84.0%)

Abbreviations: SD: Standard Deviation; CS=Caesarean Section; HX: History; FHx: Family History; AGA: Androgenetic Alopecia; PCO;Polycystic Ovaries; TE: Telogen Effluvium

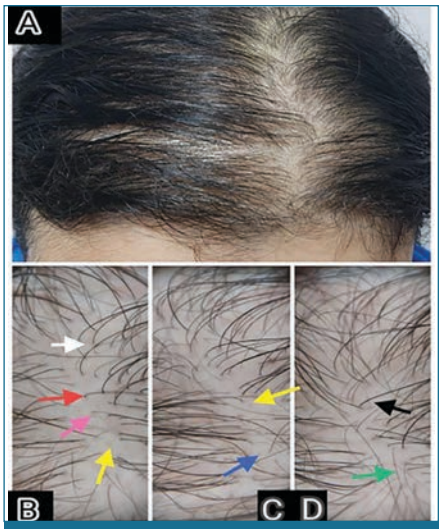

FIGURE 5. (A). 29-year-old female patient with postpartum TE, Sinclare Scale grade III. (B,C,D). Trichoscopic photos of the central area showing upright regrowing hair (black arrow), single pilosebaceous unit (red arrow), hair diameter diversity (green arrow), yellow dots (yellow arrow), peripilar sign (pink arrow), empty follicle (blue arrow) and perifollicular erythema (white arrow) which is consistent with TE associated with underlying AGA. Diagnosis: TE with AGA

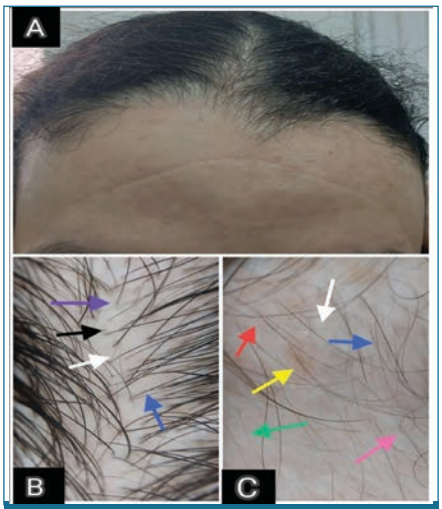

FIGURE 6. (A). 27-year-old female patient with postpartum TE showing Sinclare Scale grade I and area of hair traction (frontal and temporal). (B).Trichoscopic photo of the central area showing upright regrowing hair (white arrow), single pilosebaceous unit (purple arrow), hair diameter diversity (blue arrow) and black dot (black arrow) which is consistent with TE. (C). Trichoscopic photo of the area of traction showing reduction in hair density &HDD (blue arrow), empty follicles (white arrow), yellow dot (yellow arrow), vellus hair (green arrow), circular hair (pink arrow) and erythema (red arrow) due to persistent traction which is consistent with TA. Diagnosis: TE with TA.

patients (56.0%) had TE with AGA (TE/AGA), 13 patients (6.5%) had TE with TA (TE/TA) and 56 patients (28.0%) had TE with AGA and TA (TE/AGA/TA) (Table 3).

Relation between diagnosis and clinical examination. Regarding the relation between Sinclair scale grades and diagnosis; there was a high statistically significant presentation of Grade I in the TE group and the TE/TA group, while Grade II and Grade III were presented in the TE/AGA/TA group and TE/AGA group with *p*-value <0.001. There was no statistically significant relation between hair pull test and diagnosis with *p*-value=1.0000 (Table 4).

Correlation between Sinclair Scale and different parameters. There was a highly statistically significant positive correlation between duration of postpartum TE (weeks)

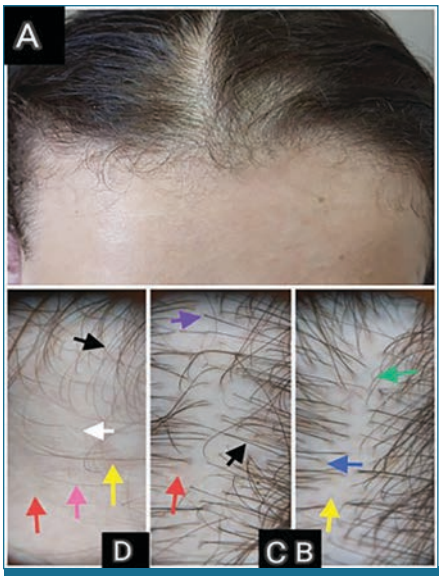

FIGURE 7. (A). 29-year-old female patient complained of postpartum TE showing Sinclare Scale grade II and area of hair traction (temporal). (B, C). Trichoscopic photos of the central area showing upright regrowing hair (green arrow), single pilosebaceous unit (purple arrow), hair diameter diversity (black arrow), yellow dots (yellow arrow), peripilar sign (blue arrow) and perifollicular erythema (red arrow) which is consistent with TE associated with underlying AGA. (D). Trichoscopic photo of the area of traction showing reduction in hair density & HDD (black arrow), empty follicles (white arrow), yellow dot (yellow arrow), vellus hair (pink arrow) and erythema (red arrow) due to persistent traction which is consistent with TA. Diagnosis: TE with AGA and TA.

TABLE 2. Clinical Examination of the studied patients (N=200)

CLINICAL EXAMINATION	n	%
Hair pull test		
Positive	200	100.0
Sinclair Scale		
I	89	44.5
II	93	46.5
III	17	8.5
IV	1	0.5

TABLE 3. Diagnosis of the studied patients (N=200)

DIAGNOSIS	n	%
TE	19	9.5
TE/AGA	112	56.0
TE/A	13	6.5
TE/AGA/TA	56	28.0
Total	200	100.0

FIGURE 8. (A). 30-year-old female patient with postpartum TE showing Sinclare Scale grade II and area of hair traction (temporal). (B,C). Trichoscopic photos of the central area showing upright regrowing hair (pink arrow), single pilosebaceous unit (green arrow), hair diameter diversity (blue arrow) and yellow dots (yellow arrow) which is consistent with TE associated with underlying AGA. (D). Trichoscopic photo of the area of traction showing reduction in hair density &HDD (blue arrow), empty follicles (white arrow), yellow dot (yellow arrow), vellus hair (black arrow) and erythema (red arrow) due to persistent traction which is consistent with TA. Diagnosis: TE with AGA and TA.

and Sinclair scale, with (*r*-value 0.283 and *p*-value<0.001) (Figure 1).

There was a statistically significant positive correlation between age "years" and number of pregnancies with Sinclair scale with (*r*-value=0.197, *r*-value=0.283 and *p*-value=0.005, *p*-value<0.05) respectively (Figures 2 and 3).

Trichoscopic findings in the central area. There was no statistically significant difference between the diagnostic groups with regard to number of terminal and vellus hair (*p*-value>0.05) (Table 5).

The most frequent trichoscopic findings in the central area in patients diagnosed with TE (n=19, 9.5%) were upright regrowing hair and single pilosebaceous unit (100%, 94.7%), followed by hair diameter diversity greater than 10 percent and perifollicular scales (78.9%, 47.4%).

In the TE /TA group (n=13, 6.5%), the most frequent trichoscopic findings in the central area were upright regrowing hair and perifollicular scales (100.0%, 76.9%), followed by single pilosebaceous unit and hair diameter diversity greater than 10 percent (69.2%, 61.5%).

In patients diagnosed with TE/AGA (n=112, 56.0%), upright regrowing hair, single pilosebaceous unit and hair diameter diversity greater than 20 percent were detected in all patients in this group, followed by peripilar sign (89.3%), perifollicular scales (50.9%), perifollicular erythema (40.2%), yellow dots (40.2%), pig tail hair (39.3%), pinpoint white dots (35.7%), black dots (17.0%), and circular hair (16.1%).

The trichoscopic findings of TE/AGA/TA (n=56, 28.0%) in the central area were almost similar to that of TE/AGA (Table 6).

Trichoscopic findings in area of traction. There was no statistically significant difference between the TE/TA group and the TE/AGA/TA group, with *p*-value >0.05.

The most frequent trichoscopic findings in 100 percent of patients were reduction in hair density, hair diameter diversity, empty follicles, vellus hair, and perifollicular erythema. The less frequent trichoscopic findings were yellow dots, comma hairs, hair cast, broken hair, loss of follicular openings, and black dots (Table 7).

DISCUSSION

Postpartum telogen effluvium (PPTE) is a commonly described entity, but few studies deal with the real incidence and pathogenesis of this claimed common disease.[12]

Postpartum TE is characterized by an increase in the proportion of hair follicles that remain in the prolonged anagen phase, rather than cycling into telogen phase. When finally released from anagen, the clinical sign of increased shedding of telogen hair will be found. Telogen hair is also known as "club hair" due to the shape of the root. Anagen hair are actively growing hair, while telogen hair, in contrast, are resting hair.[4] In postpartum telogen effluvium (PPTE) the excessive hair loss may "unmask" the underlying hair loss disorders, such as female androgenetic alopecia (FAGA) and traction alopecia (TA). Realization of this phenomenon is critical for proper treatment of patients.[8] The diagnosis of hair loss disorders depends on correlations of different diagnostic modalities such as clinical examination, hair pull test, trichoscopy, trichogram, and histopathology.

To the best of our knowledge, there were no previous reports in the literature concerning PPTE

TABLE 4. Relation between diagnosis and clinical examination

EXAMINATION	TE GROUP (n=19)		TE/AGA GROUP (n=112)		TE/TA GROUP (n=13)		TE/AGA/TA GROUP (n=56)		X^2	*P*-VALUE	SIGNIFICANCE
	n	%	n	%	n	%	n	%			
Hair pull test											
Positive	19	100.0	112	100.0	13	100.0	56	100.0	0.000	1.0000	NS
Sinclair Scale											
I	19	100.0	37	33.0	13	100.0	20	35.7	54.420	<0.001	HS
II	0	0.0	60	53.6	0	0.0	33	58.9			
III	0	0.0	15	13.4	0	0.0	2	3.6			
IV	0	0.0	0	0.0	0	0.0	1	1.8			

Using: Chi-square test for Number (%);
NS: not significant; S: significant; HS: highly significant

TABLE 5. Relation between diagnosis and number of Terminal and Vellus hair in the central area of the studied patients (n=200)

DATA TYPE	TE GROUP(n=19)	TE/AGA GROUP (n=112)	TE/TA GROUP (n=13)	TE/AGA/TA GROUP (n=56)	F-TEST	P-VALUE	SIGNIFICANCE
Terminal hair							
Mean±SD	163.37±25.25	152.66±27.88	149.69±29.13	151.82±30.70	0.925	0.429	NS
Range	88-218	67-216	81-196	68-215			
Vellus hair							
Mean±SD	6.95±2.91	7.68±4.04	5.54±2.37	8.66±6.01	1.996	0.116	NS
Range	3-13	1-21	1-11	2-36			

Using: One way Analysis of Variance test was performed for Mean±SD
NS: not significant; S: significant; HS: highly significant

and associated hair loss disorders on Egyptian patients. Our study was inspired a report by Samrao and Mirmirani[9] on three patients with postpartum telogen effluvium who were found to have an underlying condition of TA.We conducted this study to detect how postpartum telogen effluvium can unmask other underlying hair loss disorders such as FAGA and TA.

In our study, 90.5 percent of patients were diagnosed both clinically and trichoscopically as TE associated with other hair loss disorders (56.0% had TE/AGA, 6.5% had TE/TA, 28.0% had TE/AGA/TA) while only 9.5 percent of patients had TE alone.

The results are in agreement with a study conducted by Brenner and Oldoni,[13] which found that 75.0 percent of postpartum patients experiencing TE were diagnosed with FAGA after one year of follow-up, which may suggest PPTE as a possible presenting sign of FAGA. The study by Brenner and Oldoni,[13] included only 16 patients, while our study included 200 patients and other forms of hair loss. Our results are also consistent with Samrao and Mirmirani[9] in their case series that reported three patients with PPTE, which revealed the presence of underlying traction alopecia.

We reported that 44.0 percent of our patients were experiencing trichodynia. This agrees with the result of early studies by Rebora et al,[15] Grimalt et al,[16] and Kivanç-Altunay et al,[17] who observed trichodynia in 50.7%, 89%, and 36.6%, respectively, of female patients experiencing hair loss as a result of either TE or AGA.

Trichodynia refers to pain, discomfort, and/or paresthesia in the skin of the scalp. Mostly, trichodynia is associated with psychological comorbidity.[18] Both TE and AGA may be influenced by psychological stress and may be the cause of secondary stress. Psychological stress acts as a primary inducer of TE and as an aggravating factor in AGA as it is hair follicle androgen receptor co-activator.[19,21] This interprets the higher statistically significant relation between TE with AGA and trichodynia.

In our study, there was a higher statistically significant relation between TE with AGA and older age, increased number of pregnancies, and breast feeding (*P*-value<0.05). This higher statistically significant relation between TE with AGA and older age may be explained by a protective role of estrogen against FAGA, which decreases with age.[21] Ramos and Miot,[22] also reported that the frequency of FAGA increased with age in their patients. In contrast to our study, Ebrahimzadeh et al,[23] found that there was no statistically significant relationship between postpartum hair loss and number of pregnancies. However, our study agrees with Ebrahimzadeh et al's finding that there was a statistically significant relationship between postpartum hair loss and breastfeeding.[23]

In contrast to our study, Gizlenti and Ekmekci,[24] found that there was no statistically significant relationship between PPTE and breastfeeding. This might be due to the low number of patients in this study compared to our study, as it was conducted on only 58 postpartum women, while our study included 200 patients.

In our study, there was no statistically significant relationship between diagnosis and socioeconomic status, special habits, post labor complications, type of labor (CS or vaginal), acne, hirsutism, poly cystic ovaries (PCOS), and

TABLE 6. Relation between diagnosis with trichoscopic findings in central area

TRICHOSCOPIC FINDINGS IN CENTRAL AREA	TE GROUP(n=19)		TE/AGA GROUP (n=112)		TE/TA GROUP (n=13)		TE/AGA/TA GROUP (n=56)		X^2	*P*-VALUE	SIGNIFICANCE
	n	%	n	%	n	%	n	%			
HDD >20%	1	5.3	112	100.0	0	0.0	56	100.0	192.767	<0.001	HS
HDD>10%	15	78.9	112	100.0	8	61.5	56	100.0	54.920	<0.001	HS
Peripilar sign	5	26.3	100	89.3	4	30.8	51	91.1	64.242	<0.001	HS
Single Pilosebacious unit	18	94.7	112	100.0	9	69.2	56	100.0	47.524	<0.001	HS
Black dots	0	0.0	22	19.6	1	7.7	12	21.4	5.851	0.119	NS
Upright regrowing hair	19	100.0	112	100.0	13	100.0	56	100.0	0.000	1.000	NS
Circular hair	0	0.0	18	16.1	1	7.7	5	8.9	5.078	0.166	NS
Pig tail hair	1	5.3	44	39.3	1	7.7	19	33.9	12.475	0.006	S
Perifollicular scales	9	47.4	57	50.9	10	76.9	27	48.2	3.752	0.289	NS
Perifollicular erythema	5	26.3	45	40.2	3	23.1	29	51.8	6.144	0.105	NS
Empty follicles	0	0.0	22	19.6	0	0.0	11	19.6	7.528	0.057	NS
Scalp honey comb pigmentation	0	0.0	13	11.6	0	0.0	5	8.9	4.095	0.251	NS
Pinpoint white dots	0	0.0	40	35.7	0	0.0	15	26.8	15.943	<0.001	HS
Yellow dots	0	0.0	45	40.2	0	0.0	19	33.9	18.597	<0.001	HS
Arborizing red lines	0	0.0	19	17.0	1	7.7	11	19.6	5.007	0.171	NS

Using: Chi-square test for Number (%); HDD: hair diameter diversity.
NS: not significant; S: significant; HS: highly significant

menstrual disturbance, with a *p*-value>0.05. Our study is in agreement with Ebrahimzadeh et al,[23] who found that there was no statistically significant relationship between postpartum hair loss and type of delivery (vaginal or CS).

In our study, there was a high statistically significant relationship between family history of AGA and TE/AGA than TE/AGA/TA than other groups (*P*<0.001). This agrees with Nyholt et al,[25] who reported that genetic factors have a main role in etiopathogenesis of FAGA. Our current study might agree with the result of a retrospective study by Siah et al,[26] who found that nearly 85 percent of FAGA patients had a family history of AGA.

We conducted our study on postpartum female patients 6 to 8 weeks after delivery, as it is the period of the peak of postpartum hair loss as mentioned by Lynfield,[27] Ebrahimzadeh et al,[23] and Gizlenti and Ekmekci.[24]

In our study, there was a statistically significant relation between the TE/AGA/TA group and duration of PPTE than other groups (*p*=0.008). With regard to pattern of hair loss; 16.0 percent of patients experienced shedding and 84.0 percent of patients experienced shedding and thinning. There was a statistically significant higher frequency of shedding in the TE group and TE/TA group, while there was a higher frequency of shedding and thinning in the TE/AGA group and TE/AGA/TA group (*p*<0.001). This is in close agreement with a study of Kasumagic-Halilovic,[28] who found that FAGA is characterized by diffuse thinning of the crown area with an intact frontal hairline seen in 100 percent of patients in the study.

In our study, higher grades (Grade II, III) of Sinclair scale grades were presented in the TE/AGA/TA group and TE/AGA group, while low grade (Grade I) were presented in the TE group and TE/TA group. This is in agreement with the results of a study by Messenger and Sinclair,[11] who reported that Sinclair Scale grades increase with the severity of hair loss in FAGA.

In our study, there was a highly statistically significant positive correlation between duration of PPTE and Sinclair scale (*r*=0.283 and *p*<0.001). Also, there was a statistically significant positive correlation between age "years" and number of pregnancies with Sinclair scale (*r*=0.197, *r*=0.283 and *p*=0.005, *p*<0.05, respectively).

All these findings are similar to the findings by Zhang et al,[29] and Bains et al,[30] in which the Sinclair scale was positively correlated with duration of hair loss and age of patients with (*r*=0.531, *p*<0.001; *r*=0.278, *p*=0.042; *r*=0.42, *p*=0.01; *r*=0.63, *p*=0.001) respectively.

In our study, regarding trichoscopic findings in the central area, there was no statistically significant relation between the diagnostic groups and number of terminal and vellus hairs (*p*>0.05). In spite of this, there was a decrease in the number of terminal hair and increase in number of vellus hair in the TE/AGA group and the TE/AGA/TA group without significant difference. This agrees with Rushton et al,[31] and Kasumagic-Halilovic,[28] who found that trichoscopy of AGA shows an increased proportion of vellus hair and this is presumed to reflect miniaturization of terminal into vellus follicles.

Our study showed that all patients (100%) demonstrated upright regrowing hair, as it is the most sensitive trichoscopic finding in TE.[32] We also found that in patients diagnosed with TE (n=19, 9.5%), the most frequent trichoscopic findings in the central area were upright regrowing hair (100%) and single pilosebaceous unit (94.7%), followed by hair diameter diversity greater than 10 percent (78.9%) and

perifollicular scales (47.4%) while the less frequent trichoscopic findings were peripilar sign and perifollicular erythema, with the same percentage of 26.3%.

Regarding patients with TE /TA (n=13, 6.5%), the most frequent trichoscopic findings in the central area were upright regrowing hair (100%) and perifollicular scales (76.9%), followed by single pilosebaceous unit (69.2%), hair diameter diversity greater than 10 percent (61.5%) than the less frequent trichoscopic findings were peripilar sign (30.8%) and perifollicular erythema (23.1%). We noticed that the findings in the two groups are nearly close to each other as traction alopecia has no effect on the central area, but its effect is usually along the marginal hair line (frontal, temporal, or occipital).[33] In accordance with our study, Bains et al,[30] found the most frequent trichoscopic findings in TE patients were single pilosebaceous unit, perifollicular scaling, and hair diameter diversity greater than 10 percent and peripilar sign.

Studies conducted by De Lacharrière et al,[34] Ross et al,[35] and Rudnicka et al,[7] have established that there are no specific trichoscopic features in telogen effluvium. However, the presence of upright regrowing hair and single pilosebaceous unit may suggest telogen effluvium in absence of features characteristic for other causes of hair loss. Therefore, based on the current knowledge, telogen effluvium is considered to be a diagnosis of exclusion.

In patients diagnosed with TE/AGA (n=112, 56.0%), upright regrowing hair, single pilosebaceous unit and hair diameter diversity greater than 20 percent were detected in all patients in this group, followed by peripilar sign (89.3%), perifollicular scales (50.9%), perifollicular erythema (40.2%), yellow dots (40.2%), pig tail hair (39.3%), pinpoint white dots (35.7%), black dots (17.0%), and circular hair (16.1%). The trichoscopic findings of the patients with TE/AGA/TA (n=56, 28.0%) in the central area were almost similar to that of the TE/AGA as traction alopecia has no effect on the central area and the most prominent findings in the central area are that of AGA.[36]

In our study, in the TE group and TE/TA group, hair diameter diversity was greater than 10 percent while in other groups (TE/AGA and TE/AGA/TA) hair diameter diversity became greater than 20 percent as PPTE showed the underlying female pattern AGA which increases hair diameter diversity. This agrees with various studies such as Inui et al,[37] Kibar et al,[36] Rakowska et al,[38] Tawfik et al,[39] Nagar and Dhudshia,[40] and Bains et al,[30] which considered hair diameter diversity of more than 20 percent as a hallmark of AGA. Hair diameter diversity is due to miniaturization of hair follicles in the genetically predisposed scalp regions due to androgen effect and modulated through DHT as explained by De Lacharrière et al.[34]

Regarding single pilosebaceous unit, our results are similar to Rakowska et al[38] and Tawfik et al,[39] who reported a high percentage of single pilosebaceous unit on the frontal scalp of AGA patients.

In our study, we found peripilar sign in TE/AGA and TE/ AGA/TA groups with a percentage of more than 89 percent, and a lower percentage in other groups, as it is linked to superficial perifollicular infiltrates mainly composed of lymphocytes denoting micro-inflammation. This inflammation occurs early in the course of AGA and it is believed to facilitate the progressive miniaturization of hair follicles.[41]

This is similar to studies by Hu et al,[42] Köse and Güleç,,[43] Ramos et al,[44] and Tawfik et al,[39] in which peripilar sign was observed in the range of 20 to 60 percent of AGA patients.

We suggest that percentage of our study is more than other studies as our patients are already experiencing TE associated with AGA while other studies focused on AGA alone. The presence of underlying TE contributes to decreased hair density, which makes the peripilar sign more noticeable.

We observed yellow dots in 40.0 percent of patients. Previous studies reported different percentages in yellow dots. Hu et al,[42] Kibar et al,[36] and Tawfik et al,[39] found that yellow dots range from 15 to 26 percent. Other studies as Rakowska et al,[38] reported higher percentages (63%) than our study. Lima et al,[45] suggested that yellow dots are seen in more advanced stages of the disease and indicate the chronicity of AGA.

In our study, the less frequent trichoscopic findings in the central area were scalp discoloration, arborizing red lines, pig tail hair, pinpoint white dots, black dots, and circular hair. Compatible to our study, Bains et al,[30] found that black dots, scalp discoloration, scalp erythema, pig tail hair, and arborizing red lines were rare findings either in TE or AGA. In our study, increased hair diameter diversity made scalp honeycomb pigmentation and arborizing red lines appear more clearly.

Also in our study, the trichoscopic findings in area of traction in patients with hair traction (n=69, 34.5%) showed no statistically

TABLE 7. Comparison between TE/TA group and TE/AGA/TA group regarding trichoscopic findings in area of traction

TRICHOSCOPIC FINDINGS IN AREA OF TRACTION	TE/TA GROUP (n=13)		TE/AGA/TA GROUP (n=56)		X^2	*P*-VALUE	SIGNIFICANCE
	n	%	n	%			
Reduction in hair density	13	100.0	56	100.0	0.000	1.000	NS
HDD	13	100.0	56	100.0	0.000	1.000	NS
Empty follicles	13	100.0	56	100.0	0.000	1.000	NS
Vellus Hair	13	100.0	56	100.0	0.000	1.000	NS
Perifollicular erythema	12	92.3	49	87.5	0.234	0.629	NS
Hair cast	3	23.1	11	19.6	0.079	0.779	NS
Yellow dots	4	30.8	33	58.9	3.301	0.069	NS
Black dots	2	15.4	13	23.2	0.372	0.542	NS
Loss of follicular openings	3	23.1	16	28.6	0.158	0.691	NS
Broken hair	3	23.1	26	46.4	2.317	0.128	NS
Comma hairs	4	30.8	7	12.5	2.598	0.107	NS
Circle hairs	0	0.0	10	17.9	2.683	0.101	NS
Coiled hairs	0	0.0	1	1.8	0.234	0.629	NS
Arborizing red lines	0	0.0	1	1.8	0.234	0.629	NS

Using: Chi-square test for Number (%); HDD: hair diameter diversity.
NS: not significant; S: significant; HS: highly significant

significant difference between the TE/TA group (n=13, 6.5%) and the TE/AGA/TA group (n=56, 28.0%) ($p>0.05$). As the site of hair traction is away from the area affected by AGA which is the crown region with maintenance of the frontal hairline.[36]

The most common trichoscopic findings were reduction in hair density, hair diameter diversity, empty follicles and vellus hair (100%), followed by perifollicular erythema (88.4%) and yellow dots (53.6%) then the less frequent trichoscopic findings were broken hair, loss of follicular openings, black dots, hair cast, comma hairs and circle hairs. These findings are in line with those of Polat,[46] who reported that reduction in hair density, hair diameter diversity, empty follicles, and vellus hairs were observed in all patients (100%). In addition, the following were observed: loss of follicular openings (76%), yellow dots and broken hairs (68%), black dots (48%), hair casts (28%), and circular hairs (20%).

CONCLUSION

The present study highlights a novel and important association between postpartum TE and other underlying hair loss disorders. TE can unmask underlying FAGA and TA. Awareness of this phenomenon is important for appropriate diagnosis and treatment. The present study also supports the trichoscopic evaluation of hair loss disorders which provides a noninvasive diagnostic tool that can differentiate between different causes of hair loss. Proper dermatological care and counseling of postpartum female patients is a necessity to explore any underlying hair loss disorder.

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