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ORIGINAL ARTICLE

A CLINICAL, BIOCHEMICAL, AND TRICHOSCOPIC STUDY OF FEMALE PATIENTS WITH NON-SCARRING ALOPECIA

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ABSTRACT

Background: Telogen effluvium and female pattern hair loss are the leading causes of non-scarring alopecia in females. Clinical similarity may exist between them, especially in the early stage of pattern loss. Trichoscopy is a helpful diagnostic tool. This study evaluated the association between trichoscopic features of both conditions with the diagnosis and some laboratory parameters.

Materials & Methods: Ninety-two female patients with diffuse hair loss were involved in this cross-sectional study. The patient's history was taken; clinical and trichoscopic examinations were performed. Thyroid stimulating hormone (TSH), serum ferritin, and Vitamin D3 level were assessed. A t-test was used to compare the means of the groups and a Chi-square test for categorical data analysis.

Results: Telogen effluvium (TE) was the diagnosis in the majority. The most frequent age group was the 16-25 years old. Neither serum ferritin, serum Vitamin D3 nor TSH was associated with the type of hair loss. Trichoscopic features, including anisotrichosis, empty follicles, and Peripilar sign, were significantly associated with female pattern hair loss (FPHL), while regrowing hairs were highly associated with TE. The mean number of vellus hair was markedly higher in FPHL, and similarly was the number of follicles with a single hair.

Conclusion: Trichoscopy with a handheld dermatoscope helps differentiate the different types of non-scarring alopecia precisely.

KEY WORDS: Trichoscopy; Female pattern hair loss; Telogen effluvium.

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INTRODUCTION

Hair loss or alopecia is one of the common dermatological complaints among females. It could be of different aetiologies with similar clinical presentation. The leading causes of hair fall among females are telogen effluvium (TE) and female pattern hair loss (FPHL), also called androgenetic alopecia. [1]

Micronutrients, including vitamins and minerals, are essential for the physiological development of hair follicles. Different studies have established an association between hair loss and micronutrient deficiency, especially Vitamin D and iron.[2] Some endocrine disorders, especially hypo, and hyperthyroidism, may cause chronic telogen effluvium to be unresponsive to therapy.[3] The diagnosis of hair fall may be challenging. Trichoscopy (hair and scalp dermoscopy) is a new rapid, noninvasive technique that aids in diagnosing and following up on hair and scalp disorders. Trichoscopy is very helpful in differentiating the different types of hair loss. It can easily distinguish scarring from nonscarring alopecia, recognize early cases of androgenetic alopecia from telogen effluvium, and it also helps confirm the diagnosis of alopecia areata and predict the prognosis.[4]

This study aimed to analyze the trichoscopic features seen by a handheld dermatoscope and to correlate the trichoscopic findings with the clinical diagnosis and some laboratory tests.

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MATERIALS AND METHODS

This hospital-based observational, descriptive cross-sectional study enrolled a convenience sample of ninety-two female patients selected from patients attending our dermatology teaching centre who met the inclusion criteria.

Patients were explained the aims and objectives of the study, and after providing proper consent, they were included in the study. Garian assent was obtained for those below eighteen years of age.

Inclusion criteria: Female patient of all age groups with diffuse hair fall of the non-scarring type who agrees to participate in the study

Exclusion criteria: Patients with scarring alopecia, pregnant women, patients on treatment for hair fall, patients with inflammatory scalp disorders, hair shaft disorders, patients on chemotherapy, and doubtful cases when definite diagnosis could not be made clinically.

The patient's clinical history was taken, including age, marital status, parity, duration of hair loss, type of hair loss; suddenly increased shedding or gradual diffuse thinning, menstrual irregularities, excessive body hair, pregnancy or abortion during the last year, psychologic and physical stress, operations, any special diets, medication intake and family history of hair loss. Systemic disease was asked for with a particular emphasis on Coronavirus disease (COVID19). SARS-CoV-2 qualitative PCR test confirmation was requested.

A complete physical, systemic, and mucocutaneous examination was done, and the type of alopecia was assessed clinically. Signs of hyperandrogenism were looked for like acne, hirsutism, acanthosis nigricans, and striae. A hair-pull test was done from multiple areas of the scalp, and if more than 2 to 3 hairs were pulled out from each site, the test was considered positive. [5]

Patients with diffuse shedding, a history of precipitating factors, and a positive hair pull test were diagnosed as TE. Pattern hair loss was diagnosed in those with a reduction of hair density over the crown, parietal, temporal, and vertex regions and widening of the central part line. Patients with diffuse thinning of the crown area and a preserved frontal hairline (Ludwig's type) were classified according to the 5-point Sinclair scale. Those with breached frontal midline with a widened central part of the scalp without diffuse hair loss, the Christmas tree pattern of hair loss, were classified according to the Olsen scale. The Hamilton- Norwood classification was used when thinning was associated with bitemporal recession.[6] Patients were excluded if the clinical presentation was debatable.

Trichoscopy was performed using a handheld dermatoscope (DermLite II Hybrid m, 3Gen, USA), which allows a 10-fold magnification of the scalp; polarized and nonpolarized modes were used without an interface solution. Images were captured with an iPhone 11 adapted to the dermoscope and were analyzed later on a computer, where photos were further digitally magnified to the size of a computer screen. Trichoscopy was performed in hair separation lines in five scalp areas: frontal, right and left temporal, vertex, and occipital.[7]

These trichoscopic features were looked for: Anisotrichosis, empty follicles, percentage of pilosebaceous units with one, two, three, and more than three hairs, the number of vellus hairs, peripilar sign, upright regrowing hair, the type of blood vessels, perifollicular scale, and erythema.

Laboratory investigations included complete blood counts, serum ferritin, thyroid function test, and serum Vitamin D3. Further tests were asked for in patients with evidence of pattern loss and signs of virilization, including total and free testosterone, dehydroepiandrosterone, sex hormone binding globulin, luteinizing hormone, follicle stimulating hormone, and prolactin. The study was approved by the local ethics committee.

Statistical analysis: IBM SPSS software package, version 26.0, was used for data analysis. Data normality was tested in different groups using Shapiro–Wilk & Kolmogorov-Smirnov tests. Quantitative data were expressed in minimum, maximum, and mean ±SD. The parametric data were analyzed by independent samples t-test to compare the means in different groups, while the Mann-Whitney U test was used to compare the median (ranks) of the various groups. Categorical (qualitative) data were analyzed using the Chi-square test. The level of significance was set at 0.05 or less.

RESULTS

Patients' ages ranged from 10 to 55 years with a mean ± standard deviation (SD) of 28.87 ± 9.99 years. Table-1 shows the age distribution amonge the groups of hair fall.

Ludwig pattern of hair loss was noted in 18 (19.6%) patients, from which 6 (6.5%) had Sinclair grade 2, 11 (12%) were Sinclair grade 3 and 1 (1.1%) had Sinclair grade 4. The Christmas tree pattern was observed in 15 (16.3%) patients, on subclassification, 10 (10.9%) were Olsen grade 2 and 5 (5.4%) Olsen grade 3 and one patient (1.1%) was diagnosed with Hamilton-Norwood type grade II a.

Fifty percent of our patients were single, and the other half were married; only three (3.3%) patients had a pregnancy during the last year.

Family history of hair fall was positive in 58 (63%) patients; no significant association was found between the type of hair loss and positive family history, p-value 0.511.

Thirty (32.6%) patients had a history of COVID19 infection during the last year, and all had mild to moderate disease. They all had acute TE.

Hirsutism was seen in five (5.4%) patients with no significant association with the type of hair loss. Four (4.3%) patients had controlled hypothyroidism.

Duration of hair fall was significantly higher in those

with FPHL compared to patients with TE, p-value 0.001.

Table-2 shows the association between trichoscopic features and the type of hair loss.

The mean number of vellus hair in each scalp region is identified in table-3.

Table-4 gives the association between follicular units with one, two, or three hairs and either type of hair loss. The ratio of single-hair units in the frontal to occiput area of about 4:1 was found.

The most common type of blood vessels noted was the arborizing type seen in 78.3%, and the doted type was seen in 5.4%. Erythema was reported in 60.9% and perifollicular white scale in 45.7%.

No significant association was found between serum ferritin, serum Vitamin D3, TSH, and the type of hair loss, with p-values 0.176, 0.213, and 0.120, respectively. The minimum serum Vitamin D3 level was 3 ng/dl, and the maximum was 45 ng/dl, with a mean ±SD of 17.432±10.584. A significant association between serum Vitamin D3 and the number of hairs per follicular unit in frontal and temporal areas was found, p-values 0.013 and 0.039, respectively.

Although the minimum serum ferritin was 2.15 ng/dl, maximum of 153 ng/dl with a mean ±SD of 24.511±27.375, no significant association was found with any trichoscopic features; likewise, the serum TSH level with a mean±SD of 1.881±0.865.

No hormonal abnormality was detected in those patients who had a hormonal assay.

No significant association was found between the clinical grading scale of FPHL and trichoscopic findings.

Table 1: Age distribution of telogen effluvium and pattern hair loss.

Age groups (years)	TE no. (%)	FPHL no. (%)	Total	p-value
≤15	4 (6.9%)	0 (0.0%)	4 (4.3%)	0.016
16-25	29 (50.0%)	9 (26.5%)	38 (41.3%)	
26-35	14 (24.1%)	12 (35.3%)	26 (28.3%)	
36-45	10 (17.2%)	8 (23.5%)	18 (19.6%)	
≥45	1 (1.7%)	5 (14.7%)	6 (6.5%)	
Total	58 (100.0%)	34 (100.0%)	92 (100.0%)	

Table 2: Trichoscopic features observed in either type of hair loss

Trichoscopic feature	TE no. (%)	FPHL no. (%)	p-value
Anisotrichosis	18 (31%)	34 (100%)	< 0.001
Empty follicles			
Frontal	17 (29.3%)	31 (91.2%)	< 0.001
Temporal	13 (22.4%)	25 (73.5%)	<0 .001
Vertex	8 (13.8%)	23 (67.6%)	< 0.001
Occipital	3 (5.2%)	7 (20.6%)	0.022
Peripilar sign			
Frontal	30 (51.7%)	33 (97.1%)	< 0.001
Temporal	2 (3.4%)	10 (29.4%)	< 0.001
Vertex	15 (25.9%)	25 (73.5%)	< 0.001
Occipital	4 (6.9%)	7 (20.6%)	0.051
Regrowing hair			
Frontal	50 (86.2%)	15 (44.1%)	< 0.001
Temporal	47 (81.0%)	11 (32.4%)	< 0.001
Vertex	47 (81.0%)	9 (26.5%)	< 0.001
Occipital	38 (65.5%)	8 (23.5%)	< 0.001

Table 3: Mean number of vellus hair

Site	TE	FPHL	p-value
Frontal	3.69 (2.879)	12.12 (7.623)	<0 .001
Temporal	4.21 (2.919)	10.65 (9.342)	< 0.001
Vertex	2.43 (2.637)	6.26 (3.864)	< 0.001
Occipital	1.34 (1.671)	4.76 (3.163)	< 0.001

Table 4: The mean percentage of the number of hairs/ follicular units

Area	Number of hairs/ follicular units	TE	FPHL	p-value
Frontal	One	27.69 (15.523)	59.79 (22.965)	<0 .001
	Two	47.95 (11.611)	33.12 (15.115)	< 0.001
	Three	20.93 (13.355)	7.47 (8.778)	< 0.001
	> Three	2.00 (3.223)	0.26 (0.898)	0.003
Temporal	One	24.60 (17.064)	45.76 (22.351)	< 0.001
	Two	50.52 (14.855)	43.18 (20.063)	0.048
	Three	20.50 (12.002)	9.50 (9.424)	< 0.001
	> Three	2.91 (5.031)	0.41 (0.857)	0.005
Vertex	One	22.21 (13.680)	33.12 (18.721)	0.002
	Two	49.05 (12.556)	46.06 (15.329)	0.312
	Three	21.45 (11.864)	17.91 (11.461)	0.166
	> Three	5.36 (7.171)	2.50 (4.581)	0.040
Occipital	One	7.84 (6.360)	17.53 (19.055)	0.001
	Two	37.76 (11.748)	43.50 (14.702)	0.042
	Three	36.10 (11.360)	30.79 (10.502)	0.029
	> Three	17.74 (10.497)	12.00 (9.493)	0.010

DISCUSSION

Most patients in the study had TE, and around one-third had FPHL, which is consistent with other investigators.[3] Both conditions are the leading causes of non-scarring alopecia in females.[8] We noticed pattern hair loss mainly in the age group 26-35 years, while 50 % of TE was seen among 16-25 years of age. In comparison, 21-30 and 21- 40 years were the ages of the maximum prevalence of TE.[9] Family history did not correlate to the two types of hair loss, which could be related to different ethnicities, and genetic factors need to be defined. Other investigators found similar findings.[3] In 100% of our patients with acute TE, the cause was COVID-19 infection. TE following SARS-CoV-2 illness has been reported.[10,11] A lower serum ferritin level is associated with TE, as severe iron deficiency may affect hair follicle matrix cells.[12] Although very low iron stores were detected, no significant relation was found with TE or FPHL; this could be related to the genetic nature of pattern loss and the variety of etiologies for TE. In a meta-analysis, serum ferritin was significantly lower in women with nonscarring alopecia compared to controls.[13] There is no dought about the role of Vitamin D in the growth and development of hair follicles, but there is much debate regarding its role in TE and FPHL.[2] In this study, the serum level of Vitamin D was significantly correlated with the number of hairs per follicular unit in frontal and temporal areas; other investigators showed that Vitamin D3 supplementa-

tion greatly improved hair growth. [9]Pakistan. In the present study, 40 adult women suffering from the problem of TE were included. Each woman was treated with oral vitamin D3 (200,000 IU In comparison, a correlation between low levels of Vitamin D3 and the incidence of FPHL was found by Banihashemi et al.[14] Androgen levels were normal in all patients with FPHL. The exact role of circulating androgens in establishing FPHL is unknown. FPHL may develop without hormonal disturbance.[15] Trichoscopy using a handheld dermatoscope is a practical bedside way of diagnosing hair diseases. Anisotrichosis is a term used to describe hair shaft diameter diversity[16]. In this study, anisotrichosis was seen in 100% of patients with FPHL and nearly one-third of patients with TE, possibly due to the coexistence of the two conditions. Yellow dots are empty hair follicles filled with keratosebaceous material; they are not specific for TE or FPHL. In this study, empty hair follicles were highly associated with FPHL. A handheld dermatoscope can't identify typical yellow dots; higher magnification is needed[16]; however, we could locate empty follicles in both conditions.

Peripilar sign or the perifollicular hyperpigmentation represents perifollicular lymphocytic infiltrate; it was significantly seen in FPHL and less frequently in TE in this study, which was in concordance with the finding of other researchers.[17] Upright regrowing hairs are solid, pigmented with a pointed end. They represent new anagen hair; they are common in TE but may be present also in FPHL. In this study, regrowing hair was highly associated with TE; other investigators observed similar findings.[18] One of the features of pattern hair loss is a reduced number of hairs per follicular unit in the frontal area, although it may also be a feature of TE. [19] In this study, the mean number of single and double-hair pilosebaceous units in the frontal area was highly associated with FPHL, and the frontal to occiput area ratio of single-hair units above 2:1 was found, which is a minor criteria of FPHL. [16]

The main limitation of this study was the magnification of the handheld dermatoscope, restricting the trichoscopic features revealed.

CONCLUSION

It is essential to differentiate female pattern hair loss from elogen effluvium as they differ in their treatment and prognosis. Trichoscopy can make this difference easily, while laboratory markers have no significant role.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	AAS, DSQ
Acquisition, Analysis or Interpretation of Data:	AAS, DSQ
Manuscript Writing & Approval:	AAS, DSQ

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.