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Original Research Article

A study of clinicoepidemiological profile and trichoscopic features in clinical patterns of female pattern hair loss in a rural tertiary care hospital

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Abstract

Introduction: Female pattern hair loss (FPHL) involves gradual thinning in the frontal, central, and parietal scalp regions and is linked to significant psychological distress. Despite its high prevalence, data on FPHL in the Indian population is limited. Dermoscopy, being a noninvasive diagnostic tool, enhances visualization of surface and subsurface structures that are not visible to the naked eye.

Aim and Objectives: This study aimed to describe the clinico-epidemiological profile and trichoscopic findings of FPHL, while correlating them with disease severity in a tertiary care rural hospital.

Materials and Methods: The cross-sectional descriptive study was conducted in 100 females, aged 18 years and above, clinically diagnosed with FPHL, attending the dermatology outpatient department over an 18-month period. A detailed history was obtained and scalp examination was done. The pattern of hair loss in each patient was documented, followed by a dermatoscopic examination.

Results: The majority of patients were aged 18-30 years, with a mean age of 34.2 ± 10.46 years. Sinclair grade II (33%) was the most common hair loss pattern. Hair diameter diversity and yellow dots were the most frequent dermoscopic findings. Single hair follicular unit, white peripilar sign and focal atrichia were noted significantly in advanced stages (Sinclair V and Ludwig III), while BPPS was more common in early stages (Ludwig I and II).

Conclusion: Trichoscopy is a valuable tool for diagnosing and predicting FPHL. Our study emphasized its importance in detecting early follicular changes before visible hair loss. Regular clinical and trichoscopic follow-ups are essential for monitoring disease progression and treatment response.

Keywords: Female Pattern Hair Loss (FPHL), Trichoscopy, Dermoscopy, Sinclair, Ludwig.

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1. Introduction

Female pattern hair loss (FPHL), being the leading cause of non-scarring alopecia, impacts approximately 50% of women with an onset at puberty in all ethnicities.[1] There is gradual hair loss in the central and forehead regions of the scalp, while preserving the forehead hairline in contrast to male androgenetic alopecia (MAGA), which is characterized by a receding frontal hairline, followed by baldness and central hair loss. Loss of hair density, while typically non-scarring and non-inflammatory, can cause distress for many people leading to psychological stress, including depression, anxiety, and low self-esteem, which can impact patients' overall quality of life.[2]

It is caused by an interplay between androgens, their metabolites and hereditary predilection. Specifically, testosterone conversion to dihydrotestosterone within the dermal papilla results in gradual shrinking of hair follicles, hair thinning, and the development of alopecia. Microinflammation of the follicular bulge, aberrant sensitivity of hair follicles to circulating androgens, and arrector pili muscle abnormalities are all contributing elements to the etiology. The decline in hair density may also be due to the prolongation of the kenogen phase, which occurs along with the shrinkage of the hair follicle in the frontoparietal area.[1] Since androgens' contribution to the onset of female pattern baldness has not yet been thoroughly established, the term "FPHL" has been used.[3] The Ludwig,

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Olsen, and Sinclair classifications are three popular grading techniques that allow finer classification, making it potentially useful for early detection.[2]

FPHL is typically diagnosed based on clinical presentation, however in dubious situations, trichoscopy may assist physicians in making an accurate diagnosis and avoiding further invasive diagnostic approaches such as scalp biopsy. Rudnicka and Olszewska invented the word trichoscopy in 2006. This noninvasive dermoscopy-based approach has the potential to increase the accuracy of hair disease diagnosis. During trichoscopy, images of the hair shafts in the frontal, occipital, and temporal areas are routinely studied at magnifications of 20 to 1000 times. It is used for early diagnosis, measuring disease activity, severity, and prognosis, as well as adjusting therapy response.[1] The earliest diagnostic feature being hair shaft diameter variation of >20% hair shafts whereas other dermoscopic features include short vellus hair, yellow dots, pinpoint white specks and scalp pigmentation, peripilar sign.[4]

Since there is dearth of studies among Indian population, we intend to do the present study to assess the clinico-epidemiological aspects, analyse the trichoscopic findings and correlate with disease severity of female pattern hair loss in a rural setting.

2. Aims and Objectives

1. To describe the clinico-epidemiological profile and clinical patterns of female pattern hair loss
2. To assess the trichoscopic features across clinical patterns of female pattern hair loss and correlate these findings with disease severity.

3. Materials and Methods

This was a cross-sectional descriptive study conducted on patients who were clinically diagnosed with FPHL and attended the Department of Dermatology, Adichunchanagiri Hospital and Research Centre, B.G. Nagara, during a period of 18 months (October 2022 - March 2024). The study included a sample size of 100 female patients with pattern hair loss, based on previous outpatient statistics indicating approximately 70 patients annually. Given the 18-month study duration, periodic sampling was used to determine the sample size.

3.1. Inclusion criteria

Females above 18 years of age with clinically diagnosed female pattern hair loss and willing to participate in the study.

3.2. Exclusion criteria

The study excluded pregnant and lactating women, patients with diffuse or patchy hair loss in the frontovertical or frontotemporal areas, and those with hair loss patches lacking follicular openings or showing wrinkled skin. Additionally, individuals who had undergone hair transplantation, those who received topical or systemic treatments for hair loss, and patients on chemotherapy in the past year were also excluded.

Institutional ethics committee approval was obtained, and written informed consent was obtained from all patients before enrollment. A detailed history was collected using a structured questionnaire, followed by a thorough general and systemic examination, which was documented in a standard proforma. Scalp examinations focused on hair loss pattern, severity, type, and any underlying dermatoses. Hair was assessed for color, texture, and shaft abnormalities. Hair shedding was assessed using a visual scale developed by Sinclair and a hair pull test. In the hair pull test, a bundle of 50–60 hairs was grasped at the base near the scalp and tugged firmly. If more than 10% of the grasped hairs (averaging more than 6 hairs) were pulled out, the test was considered positive. Hair loss was graded using the Ludwig scale, Sinclair scale, Olsen scale, or Hamilton-Norwood scale, excluding Sinclair grade I as it is considered as normal. Hair loss patterns were photographed with consent. Trichoscopic examination was performed using an ILLUCO IDS-1100 Dermatoscope (10x magnification) over the frontal, occipital, and temporal areas. Hair diameter diversity was measured at a point 2 cm from the frontal hairline in the midline and compared with the occipital scalp.

The data collected were entered into a Microsoft Office Excel sheet and analyzed using SPSS software version 29.0. Results were presented as appropriate percentages and proportions. Relevant inferential statistical tests, such as the chi-square test for qualitative data and the T-test for quantitative data, were conducted to interpret the results. A p-value of less than 0.05 was considered statistically significant.

4. Results

This study included 100 patients diagnosed with FPHL between October 2022 and March 2024. The majority (45%) of patients were aged 18–30 years, with a mean age of 34.2 ± 10.46 years. The youngest patient was 18 years, and the oldest was 60 years.Most were homemakers (58%) and reported hair loss onset between the ages of 20 and 29, with a mean onset age of 31.3 years. The duration of hair loss was typically 1–5 years, with a mean of 3.06 years. Visible vertex thinning (51%) and widening of the hair partition (24%) were the most common presentations. While 69% of patients were asymptomatic, the remaining reported itching (18%) and scaling (7%). Comorbidities included hypothyroidism (12%), polycystic ovary syndrome (PCOS) (10%), and anemia (8%). A family history of FPHL was present in 26% of patients; however, it was not statistically significant in relation to early onset. The most common associated cutaneous finding was seborrheic dermatitis (13%), followed by acanthosis nigricans (8%).

Majority of the patients experienced hair loss from the frontal area (52%), followed by widening of the central

parting (45%). The most common hair loss pattern was classified as Sinclair (54%), followed by Ludwig (32%), Olsen (10%), and Hamilton-Norwood (4%) (**Figure 1**). Hair pull test was positive in 31% of patients. The trichoscopic features observed were hair diameter diversity (>20%) (HDD>20%) in 95%, single follicular unit (SFU) in 74%, yellow dots (YD) in 72%, scalp honeycomb pigmentation (SHCP) in 58%, short vellus hair (SVH) in 46%, white peripilar sign (WPPS) in 39%, brown peripilar sign (BPPS) in 35% and focal atrichia (FA) in 15% (**Figure 2**, **Figure 3**). On comparison of trichoscopic findings between frontal and occipital scalp, the incidence of hair diameter diversity, brown peripilar sign, white peripilar sign, yellow dots, focal atrichia, short vellus hairs, and honeycomb pigmentation were found to be statistically significant ($p \leq 0.001$).

4.1. Sinclair pattern

Out of 54 patients, 33 (61.11%) had Sinclair grade II, 13 (24.07%) had grade III, 6 (11.11%) had grade IV, and 2 (3.7%) had grade V (**Figure 4**). Higher Sinclair grades (IV and V) were more common in patients over the age of 50 years. A normal hair shedding score (1-4) was present in 77.8% of patients. Majority had established FPHL (75.9%), increasing with hair loss duration but not significantly (p=0.698). Positive hair pull tests were noted in 31.7% of patients with established FPHL and 30.7% of those with early FPHL, with no significant difference. Most established FPHL patients (70.7%) had a Sinclair hair shedding score of 1-4, indicating that daily hair shedding was low in established FPHL (p-value=0.05). Higher Sinclair grades (III, IV, V) were exclusive to established FPHL (p=0.008). Trichoscopic findings showed hair diameter diversity in all cases of established FPHL and in 69.2% of early FPHL cases (p=0.002). Yellow dots were observed in 87.8% of patients with established FPHL compared to 61.5% of those with early FPHL (p<0.05). Focal atrichia was found in 26.8% of established FPHL cases (p<0.05). Additionally, 25-50% of single hairs per follicular unit were observed in 46.3% of established FPHL cases compared to 7.6% of early FPHL cases, which was also statistically significant (p<0.05) (**Table 1**).

4.2. Ludwig pattern

Among 32 patients with Ludwig-pattern hair loss, 56.25% had grade I, 34.37% had grade II, and 9.30% had grade III (**Figure 5**). Age and duration of hair loss were negatively correlated with Ludwig classification (r = -0.656, p < 0.05; r = -0.651, p < 0.05). Hair diameter diversity was noted across all grades. White peripilar sign (WPPS) (100%) and focal atrichia (33.3%) were more common in advanced stages (Ludwig III), but the differences were not statistically significant. Brown peripilar sign (BPPS) was more prevalent in earlier stages of Ludwig-pattern hair loss. A statistically significant association (p = 0.04) was observed, with 50-75% of single hairs per follicular unit found exclusively in Ludwig II (63.6%) (**Table 2**).

4.3. Olsen pattern

The majority of patients (80%) were classified as grade II, with one patient each in grades I and III (**Figure 6**). Hair diameter diversity was noted across all grades. Short vellus hairs (SVH), brown peripilar sign (BPPS), white peripilar sign (WPPS), and focal atrichia (FA) were observed only in grade II patients (37.5%, 12.5%, 50%, and 12.5%, respectively). Yellow dots (YD) were present in all grade II and III patients. Scalp honeycomb pigmentation (SHCP) was observed in 75% of grade II patients. Single hairs per follicular unit were observed in 90% of patients (**Table 3**).

4.4. Hamilton-Norwood pattern

The majority of patients (50%) were classified as grade II, with one patient each in grades I and IV (**Figure 7**). The most common trichoscopic features observed in the Hamilton-Norwood pattern were hair diameter diversity (75%), yellow dots (75%), and single follicular units (50%).

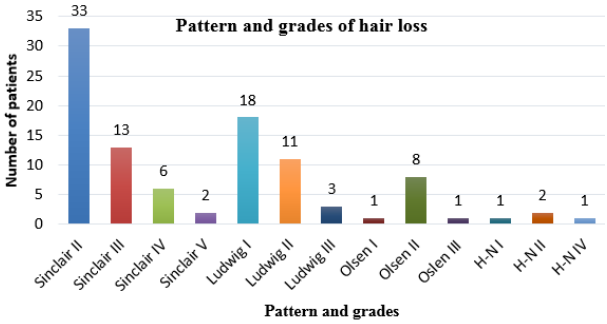

Figure 1: Clinical patterns and grades of FPHL

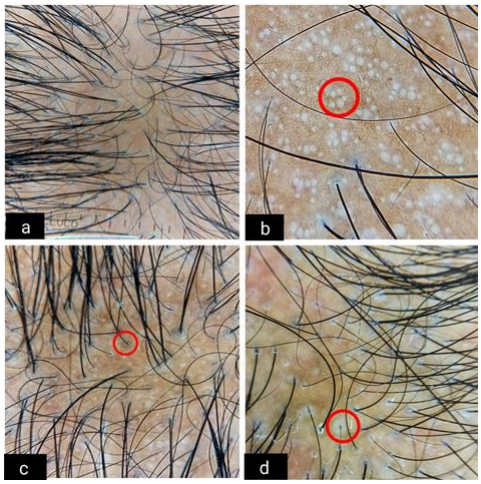

Figure 2: (**a**) Hair diameter diversity; (**b**) Yellow dots; (**c**) Brown peripilar sign; (**d**) White peripilar sign

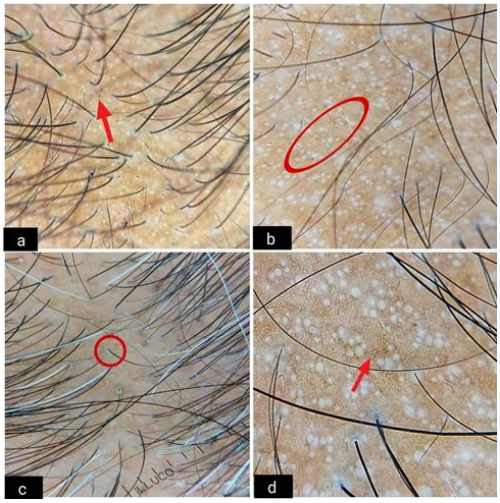

Figure 3: (**a**) Short vellus hair; (**b**) Focal atrichia; (**c**) Single follicular unit; (**d**) Scalp honeycomb pigmentation.

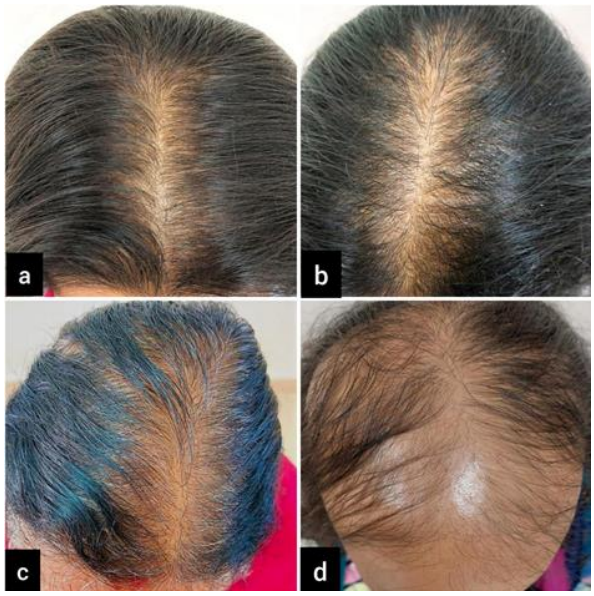

Figure 4: (**a**) Sinclair grade II; (**b**) Sinclair grade III; (**c**) Sinclair grade IV; (**d**) Sinclair grade V.

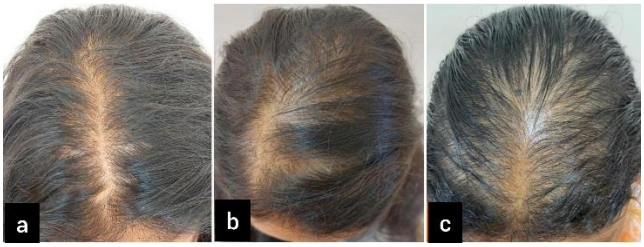

Figure 5: (**a**) Ludwig grade I; (**b**) Ludwig grade II; (**c**) Ludwig grade III.

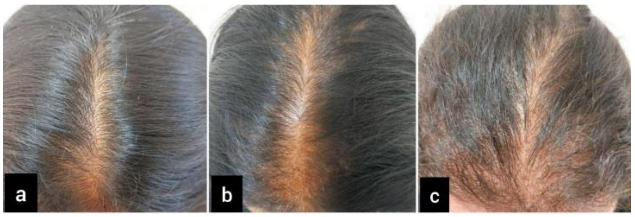

Figure 6: (**a**) Olsen grade I; (**b**) Olsen grade II; (**c**) Olsen grade III;

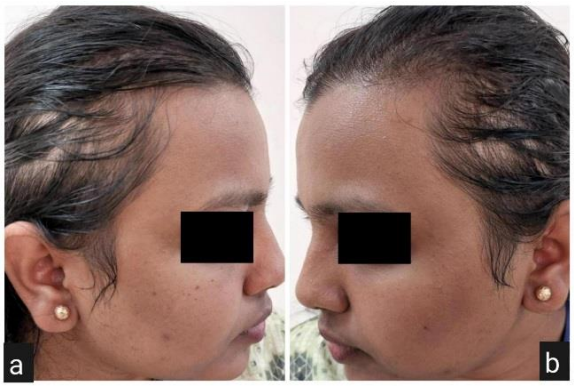

Figure 7: (**a** &**b**): Hamilton-Norwood pattern

Table 1: Correlation of trichoscopic findings and FPHL-SI

Trichoscopic findings	**Early (n=13)**		**Established(n=41)**		**P-value**
	No. of patients	**%**	**No. of patients**	**%**	
Hair diameter diversity >20%	9	69.2	41	100	0.002
Short vellus hair >6 in frontal area	4	30.7	22	53.6	0.207
Brown peripilar sign	3	23.07	15	36.5	0.506
White peripilar sign	5	38.4	22	53.6	0.526
Yellow dots	8	61.5	36	87.8	0.048
Focal atrichia (4mm diameter of no hair follicles)	-	-	11	26.8	0.048
Scalp honeycomb pigmentation	9	69.2	26	63.4	1
Proportion of triple and single hair per follicular unit (frontal area)					
a. No difference	10	76.9	2	4.8	<0.001
b. 25-50% of FU are single	1	7.6	19	46.3	0.019
c. 50-75% of FU are single	2	15.3	17	41.4	0.107
d. ≥75% of FU are single	-	-	3	7.3	1

Table 2: Correlation of trichoscopic findings and Ludwig grades of hairloss

Trichoscopy Features	LI (n=18)	LII (n=11)	LIII (n=3)	P- Value
Hair diameter diversity >20%	18(100%)	11(100%)	3(100%)	1
Short vellus hair >6 in frontal area	7(38.8%)	7(63.6%)	3(100%)	0.56
Brown peripilar sign	11(61.1%)	5(45.4%)	-	0.82
White peripilar sign	2(11.1%)	3(27.2%)	3(100%)	0.09
Yellow dots	9(50%)	4(36.3%)	3(100%)	0.59
Focal atrichia (4mm diameter of no hair follicles)	-	1(9.1%)	1(33.3%)	0.43
Scalp honeycomb pigmentation	7(38.8%)	5(45.4%)	3(100%)	0.58
Proportion of triple and single hair per follicular unit (frontal area)				
a. No difference	10(55.5%)	1(9.1%)	-	0.20
b. 25-50% of FU are single	8(44.4%)	2(18.1%)	2(66.6%)	0.47
c. 50-75% of FU are single	-	7(63.6%)	-	0.04
d. ≥75% of FU are single	-	1(9.1%)	1(33.3%)	0.43

Table 3: Correlation of trichoscopic findings and Olsen grades of hairloss

Trichoscopy Features	OI (n=1)	OII (n=8)	OIII (n=1)	P-value
Hair diameter diversity >20%	1(100%)	8(100%)	1(100%)	1
Short vellus hair >6 in frontal area	-	3(37.5%)	-	0.7
Brown peripilar sign	-	1(12.5%)	-	-
White peripilar sign	-	4(50%)	-	-
Yellow dots	-	8(100%)	1(100%)	1
Focal atrichia (4mm diameter of no hair follicles)	-	1(12.5%)	-	-
Scalp honeycomb pigmentation	-	6(75%)	1(100%)	0.96
Proportion of triple and single hair per follicular unit (frontal area)				
a. No difference	-	1(12.5%)	-	-
b. 25-50% of FU are single	1(100%)	5(62.5%)	-	0.91
c. 50-75% of FU are single	-	2(25%)	-	-
d. ≥75% of FU are single	-	-	1(100%)	-

5. Discussion

This study was conducted in the Department of Dermatology at Adichunchanagiri Institute of Medical Sciences and included 100 patients. Female pattern hair loss (FPHL) is a leading cause of psychological morbidity associated with hair loss. Trichoscopy enhances the visualization of hair and scalp, facilitating the early diagnosis of FPHL.[5] Specific dermoscopic features of FPHL aid in distinguishing it from other causes of diffuse hair loss, often reducing the need for invasive procedures such as scalp biopsy.[4]

In our study, 45% of patients were aged 18–30 years, a finding similar to that of Ravikiran PS et al., but differing from John D et al., who reported a higher prevalence in the 40–49-year age group.[6,7] The younger age of presentation in our study suggests a significant impact of female pattern hair loss (FPHL) on younger individuals' quality of life, prompting earlier medical consultation. The patients' ages ranged from 18 to 60 years, with a mean age of 34.20 ± 10.46 years, which is consistent with studies by Ramatulasi S et al. (33 ± 4.5 years) and Ravikiran PS et al. (31.26 ± 9.85 years).[6,8] Additionally, 41% of patients experienced hair loss onset between the ages of 20–29 years, similar to findings by Ravikiran PS et al.[6] The mean age of onset in our study was 31.3 ± 9.58 years, in concordance with Snehal M et al.[9]

Majority of the patients (42%) had hair loss for 1–5 years, contrasting with John D et al., where 57% had hair loss for more than 10 years.[7] The mean duration was 3.06 ± 3.21 years, aligning with Ravikiran PS et al., but shorter than that reported by John D et al. (13.71 ± 7 years).[6,7] The majority (51%) of patients presented with visible vertex thinning, and 69% were asymptomatic, similar to findings by John D et al.[7] In contrast, Ohn et al. reported that itching was present in 42.9% of patients, while 9.5% experienced pain.[10]

Among the 31% of patients who reported associated symptoms, seborrheic dermatitis (13%) was the most common, followed by acanthosis nigricans (8%), acne (4%), hirsutism (4%), and striae (2%). These findings differ from those of Naik RR et al., who reported seborrheic dermatitis in 45% of patients, acne in 12%, hirsutism in 13%, and acanthosis nigricans in 7%.[11] Endocrine comorbidities included hypothyroidism (12%), polycystic ovarian syndrome (PCOS) (10%), and anemia (8%), findings similar to those of Prakash KS et al.[12] Mental stress (15%) and physical stress (8%) were also reported, which contrasts with Prakash KS et al., who found that 37.5% of patients experienced both mental and physical stress.[12]

A positive family history of FPHL was reported in 26% of patients, with maternal inheritance (13%) being more common. This contrasts with the findings of Lukasik A et al.,

who reported a 62.2% prevalence of family history, with a slight paternal predominance.[13] The mean age of onset for patients with a positive family history was 29.08 ± 11.15 years, compared to 32.08 ± 8.92 years for those without a family history, although this difference was not statistically significant (p = 0.366), a result consistent with Ravikiran PS et al.[6]

Irregular menstruation was observed in only 14% of patients, in contrast to Prakash KS et al., who reported a prevalence of 70%.[12] Additionally, postmenopausal women accounted for only 13% of cases in our study, whereas other studies have reported a higher prevalence.[7,14]

In terms of FPHL patterns, the Sinclair pattern was the most common (54%), followed by Ludwig (32%), Olsen (10%), and Hamilton-Norwood (4%). These findings contrast with Ravikiran PS et al., who reported 72% of cases with the Sinclair pattern, and Ramatulasi S et al., who found that 68.5% of patients exhibited the Ludwig pattern.[6,8] The hair pull test was positive in 31% of patients, which is comparable to the study conducted by Ravikiran PS et al.[6]

On comparing trichoscopic findings of the frontal and occipital scalp, the incidence of hair diameter diversity, brown peripilar sign, white peripilar sign, and honeycomb pigmentation were statistically significant ($p \leq 0.001$) in the present study which were consistent with the findings reported by Naik RR et al.[11]

5.1. Sinclair pattern

Among the 54 patients with the Sinclair pattern, grade II was the most common (61.11%), followed by grade III (24.07%), grade IV (11.11%), and grade V (3.7%). These findings align with those of John D et al., who reported 44% of patients with grade II and 36% with grade III among 300 participants.[7] The prevalence of Sinclair grade IV increased from 16.6% in the fourth decade to 33.3% in the fifth, while grade V was observed in 50% of individuals over the age of 50. This finding is consistent with Ravikiran PS et al., indicating that hair loss severity progresses with age.[6]

In our study, 77.8% of participants had a Sinclair hair shedding score of 1–4, suggesting normal daily shedding. Established FPHL was observed in 75.9% of cases, while 24.1% had early FPHL. Among those with established FPHL, 70.7% had a hair shedding score of 1–4, indicating minimal daily shedding. This association was statistically significant (p = 0.05), consistent with findings from John D et al.[7]

All 13 patients with early FPHL had Sinclair midline hair density grade II. Among the 41 patients with established FPHL, 20 (48.7%) had grade II, 13 (31.7%) had grade III, 6 (14.6%) had grade IV, and 2 (4.8%) had grade V. This indicates a correlation between increasing FPHL severity and decreased midline hair density, a statistically significant finding (p = 0.008), which is consistent with John D et al.[7]

In the present study, all patients with established FPHL exhibited hair diameter diversity, compared to 69.2% of those with early FPHL, a statistically significant difference (p = 0.002). Yellow dots were found in 87.8% of established FPHL cases compared to 61.5% of early cases ($p < 0.05$). Focal atrichia was observed in 26.8% of established FPHL cases, whereas none of the early FPHL cases exhibited this feature ($p < 0.05$). Additionally, 46.3% of patients with established FPHL had a higher proportion of single-hair follicular units, compared to 7.6% in early FPHL ($p < 0.05$), aligning with the findings of John D et al.[7]

5.2. Ludwig pattern

Among the 32 patients with Ludwig pattern hair loss, 18 (56.25%) were classified as grade I, 11 (34.37%) as grade II, and 3 (9.3%) as grade III. These findings are similar to those reported by Naik RR et al.[11] In the present study, a negative correlation was observed between age and Ludwig grades (rho = -0.656, p = 0.021) and between duration of hair loss and Ludwig grades (rho = -0.651, p = 0.022). This contrasts with the findings of Varma K et al., who reported positive correlations for both age ($r = 0.619$, $p < 0.05$) and duration of hair loss ($r = 0.573$, $p < 0.05$) with Ludwig grades.[15]

On trichoscopy, hair diameter diversity was observed in all patients. The brown peripilar sign was noted in 61.1% of patients with Ludwig grade I, similar to the findings of Snehal M et al. The white peripilar sign increased with disease severity, present in 11.1% of grade I cases and in 100% of grade III cases, which is consistent with Snehal M et al. This could be attributed to perifollicular fibrosis in the advanced stages of FPHL. Yellow dots were observed in 37.5% of grade II patients, comparable to the findings of Snehal M et al. Focal atrichia was present in 33.3% of grade III patients, similar to Snehal M et al. (36.3%). Scalp honeycomb pigmentation was detected in all grade III patients, whereas Snehal M et al. reported it in 81.8% of cases. Single hair follicular units increased with disease severity (44.4% in grade I to 100% in grade III), whereas Snehal M et al. found a decrease in multi-hair follicular units in advanced cases.[9]

5.3. Olsen pattern

Among the 10 patients with Olsen pattern, 8 patients (80%) were categorized as grade II, while 1 patient each in grade I and grade III. The present study observed higher prevalence rates of hair diameter diversity (100%) and yellow dots (90%), whereas brown peripilar sign (10%) and focal atrichia (10%) were less common compared to the findings of Ramatulasi S et al. White peripilar sign, honeycomb pigmentation, and single follicular units showed similar prevalence in both the studies.[8]

5.4. Hamilton-Norwood pattern

In our study, 4 patients were found to have Hamilton Norwood pattern out of which 2 had grade II, 1 each had grade I and IV. Hair diameter diversity (75%), short

honeycomb pigmentation (25%), and single follicular units (50%) were found to be lower than in Ramatulasi S et al's study. However, yellow dots (75%) and focal atrichia (25%) had similar prevalence in both the studies.[8]

6. Conclusion

In conclusion, this study highlighted the clinico-epidemiological and trichoscopic characteristics of FPHL in a rural tertiary care setting, emphasizing its ability to detect subtle follicular changes before clinical hair loss becomes apparent. Early diagnosis through trichoscopy facilitates timely intervention, potentially preventing disease progression and associated psychological distress. This study underscores the role of trichoscopy as a non-invasive, cost-effective diagnostic tool, particularly valuable in resource-limited settings such as rural tertiary hospitals. Furthermore, the findings emphasize the need for greater awareness and early intervention in younger women to mitigate the impact of FPHL on their quality of life.

7. Source of Funding

None.

8. Conflict of Interest

None.

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