



eISSN 2036-7406

## Dermatology Reports

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E-publishing of this PDF file has been approved by the authors.

*Please cite this article as:*

*Argobi Y, Alasiri FI, Omar MA. Frontal fibrosing alopecia and lichen planopilaris: epidemiology, treatment, and remission rate (2014-2024). Dermatol Rep 2026 [Epub Ahead of Print] doi: 10.4081/dr.2026.10475*

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Received: 15 June 2025; Accepted: 16 March 2026.

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# **Frontal fibrosing alopecia and lichen planopilaris: epidemiology, treatment, and remission rate (2014-2024)**

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**Key words:** frontal fibrosing alopecia; lichen planopilaris; epidemiology; clinical characteristics; diagnostic delay; treatment outcomes; pathophysiology; therapeutic strategies.

**Conflict of interest:** the authors have no conflict of interest to declare.

**Ethics approval and consent to participate:** not required.

**Availability of data and materials:** the datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## **Abstract**

Frontal fibrosing alopecia (FFA) and lichen planopilaris (LPP) are cicatricial alopecia with overlapping but distinct epidemiological, clinical, and therapeutic features. This study evaluates their epidemiological and clinical characteristics, treatment approaches, and one-year remission rates. This retrospective cohort study was conducted at Holy Family Hospital, Karachi, Pakistan. Data from electronic records included demographics, clinical presentations, histology, treatments, outcomes, and follow-up. Patients of all ages and genders diagnosed with LPP or FFA between January 2014 and December 2024, with a minimum one-year follow-up, were included. LPP patients had a higher mean age at onset ( $53.1 \pm 9.42$  years) than FFA patients ( $45.8 \pm 10.4$  years;  $p=0.02$ ). Scalp involvement was more common in LPP (95.9%), while body involvement was higher in FFA (85.7%;  $p<0.001$ ). FFA patients had more symptoms, whereas LPP was often asymptomatic ( $p<0.001$ ). Remission rates were similar at 12 months, but FFA showed higher long-term remission (59.0% vs. 39.0%;  $p=0.004$ ). FFA patients sustained remission (55.7% vs. 23.4%;  $p<0.001$ ), while LPP had more partial or no responses. This study highlighted key differences in demographics, clinical features, and treatments between FFA and LPP, with similarities in diagnostic delays and treatment approaches. Variations were noted in the age of onset, symptoms, clinical presentation, and outcomes.

## **Introduction**

Lichen planopilaris (LPP) is the most prevalent form of primary lymphocytic cicatricial alopecia (PCA).<sup>1-3</sup> Diagnosis relies on clinical and trichoscopic findings, necessitating histopathological confirmation.<sup>3,4</sup> Histologically, LPP shows a band-like perifollicular lymphocytic infiltrate in the infundibular and isthmic regions, focal vacuolar interface changes, and polytrichia. Late-stage lesions reveal sebaceous gland loss, perifollicular fibrosis, and follicular destruction.<sup>5</sup> LPP management presents challenges due to its chronic nature and resistance to treatment. Evidence supporting current therapies is limited. Remission rates vary considerably, ranging from 8% to 88%.<sup>6-8</sup>

Frontal fibrosing alopecia (FFA) is a primary cicatricial alopecia marked by recession of the frontotemporal hairline and loss of eyebrows, primarily affecting postmenopausal women.<sup>9</sup> While the frontal scalp is mainly involved, FFA can affect the entire periphery of the scalp and other hair-bearing areas. Hairline recession generally progresses symmetrically at about 0.9 cm per year. Unlike LPP, most patients with FFA are asymptomatic.<sup>10</sup>

FFA trichoscopic features resemble LPP but also include vellus hair loss, red and grey eyebrow dots, the “lonely hair” sign, and baby doll hair.<sup>11</sup> Histological similarities exist, although subtle differences may

differentiate between the two conditions. Treatment approaches resemble those for LPP, with additional emphasis on 5-alpha-reductase inhibitors. Remission rates range from 44% to 83%.<sup>12</sup>

Our study aims to assess the epidemiological and clinical characteristics, treatments, and one-year remission rates of FFA and LPP patients treated at the outpatient dermatology clinic from January 2014 to December 2024.

## **Materials and Methods**

This retrospective comparative cohort study was conducted at the outpatient clinic of the dermatology clinic at Holy Family Hospital in Karachi, Pakistan. Data were collected from electronic records, including demographic details such as age, gender, ethnicity, medical history, clinical presentations (including extent of involvement, lesion characteristics, symptoms, and severity), histological findings, treatments, outcomes, and follow-up duration.

The study participants included individuals of any age and gender diagnosed with either LPP or FFA who were followed up at the dermatology clinic between January 2014 and December 2024. All patients diagnosed with FFA or LPP during this timeframe, with a follow-up duration of at least one year, were included. The diagnosis was established based on clinical and trichoscopic findings. Patients with an inconclusive diagnosis, those unable to differentiate between LPP and FFA, concurrent LPP and FFA, the coexistence of other inflammatory scalp disorders, incomplete or inaccessible medical records, or a follow-up duration of less than one year were excluded from the study.

The evaluated demographic characteristics included gender, age at disease onset and first visit, living area classified as urban or rural, ethnicity, and Fitzpatrick skin type. The assessment of medical background encompassed hormonal factors, general and dermatological comorbidities, and medication usage. Clinical characteristics comprise the pattern and area of disease distribution, categorized as frontal, temporal, parietal, occipital, vertex, or diffuse on the scalp. Extra-scalp involvement, including eyebrows, eyelashes, axillary regions, the body, pubic area, and limbs, was also evaluated. Trichoscopic features such as perifollicular erythema, diffuse erythema, and tubular scaling were assessed. Symptoms, including pain, pruritus, and burning, were recorded, along with instances that were asymptomatic.

The treatments administered were systematically assessed. The characteristics of the disease course included age at onset, time to diagnosis, and duration of follow-up. Outcomes were classified into three groups: remission, partial improvement, and no change or worsening. These outcomes were evaluated after one year of follow-up. Additionally, remissions and relapses during follow-up were assessed and classified based on whether they occurred with or without treatment.

SPSS v. 29 was employed for data analysis. Continuous variables between LPP and FFA were compared using the *t*-test, while categorical variables were assessed using the chi-square test. The outcome variable after 12 months (an ordinal variable) was compared with categorical variables using the chi-square test and with continuous variables using a one-way analysis of variance (ANOVA) test. The remission outcome variable was examined against dichotomous variables using the chi-square test and with continuous variables using the *t*-test.

## Results

The demographic characteristics of patients with LPP and FFA are summarized in Table 1. The mean age at disease onset was significantly higher in patients with LPP ( $53.1 \pm 9.42$  years) compared to those with FFA ( $45.8 \pm 10.4$  years;  $p=0.02$ ). The proportion of female patients was significantly greater in the FFA group (73; 80.2%) than in the LPP group (51; 69.9%), with  $p<0.001$ . The mean duration from symptom onset to diagnosis was comparable between the two groups, with LPP patients having a mean diagnostic delay of  $34.6 \pm 12.3$  months and FFA patients experiencing a delay of  $34.1 \pm 19.9$  months ( $p=0.12$ ). Regarding Fitzpatrick skin type distribution, type III was the most common in both groups (18 [24.7%] in LPP and 34 [37.4%] in FFA), with no statistically significant differences across skin types ( $p=0.78$ ). Ethnic distribution showed a predominance of Arab patients in both groups: 59 (80.8%) in LPP and 82 (90.1%) in FFA ( $p=0.63$ ). Similarly, the majority of patients resided in urban areas: 68 (93.2%) in LPP and 81 (89.0%) in FFA ( $p=0.87$ ). The mean follow-up duration was nearly identical between the two groups, with LPP patients being followed for  $48.1 \pm 22.7$  months and FFA patients for  $48.7 \pm 23.5$  months ( $p=0.99$ ).

The clinical characteristics of patients with LPP and FFA are summarized in Table 2. Scalp involvement was significantly more common in LPP patients (70; 95.9%) compared to FFA patients (59; 64.8%) ( $p<0.001$ ), whereas body involvement was significantly higher in FFA patients (78; 85.7%) than in LPP patients (39; 53.4%) ( $p<0.001$ ). Regarding clinical signs, perifollicular erythema was more prevalent in LPP (66; 90.4%) than in FFA (71; 78.0%) ( $p<0.001$ ), while diffuse erythema was significantly more frequent in FFA (35; 38.5%) than in LPP (7; 9.6%) ( $p<0.001$ ). Symptomatically, pruritus (79; 86.8% vs. 19; 26.0%), burning (67; 73.6% vs. 5; 6.8%), and pain (43; 47.3% vs. 8; 11.0%) were significantly more common in FFA patients, whereas a greater proportion of LPP patients were asymptomatic (41; 56.2% vs. 19; 20.9%) ( $p<0.001$  for all comparisons). Additionally, moderate disease severity was more frequently observed in LPP patients (35; 47.9%) compared to FFA patients (31; 34.1%) ( $p<0.001$ ).

The treatment patterns in patients with LPP and FFA are summarized in Table 3. Among systemic treatments, corticosteroid use was significantly higher in FFA (18; 19.8%) compared to LPP (4; 5.5%) ( $p<0.001$ ), while minoxidil use was more frequent in LPP (11; 15.1%) than in FFA (6; 6.6%) ( $p<0.001$ ). Mycophenolate mofetil (MMF) was also used more frequently in FFA (9; 9.9%) than in LPP (2; 2.7%), with borderline significance ( $p=0.05$ ).

Regarding topical treatments, corticosteroid use was significantly higher in FFA (90; 98.9%) compared to LPP (57; 78.1%) ( $p<0.001$ ). Conversely, topical minoxidil was more commonly used in LPP (55; 75.3%) than in FFA (11; 12.1%) ( $p<0.001$ ). Additionally, calcineurin inhibitors were prescribed significantly more often in LPP (49; 67.1%) than in FFA (25; 27.5%) ( $p<0.001$ ).

At the 12-month follow-up, remission was observed in 28 patients with FFA and 21 patients with LPP. However, by the final follow-up visit, the remission rates increased to 51 patients in the FFA group and 42 patients in the LPP group. No significant differences were noted between the two groups at the 12-month follow-up. Nonetheless, remission rates during the follow-up period (maintained with treatment) were significantly higher in patients with FFA compared to those with LPP (59.0% in FFA vs. 39.0% in LPP;  $p=0.004$ ). The mean time to remission was comparable between the groups ( $21.4\pm 14.8$  months;  $p=0.76$ ).

At the final follow-up visit, a significantly greater proportion of FFA patients achieved sustained remission with treatment compared to LPP patients (55.7% in FFA vs. 23.4% in LPP;  $p<0.001$ ). In contrast, a partial response was significantly more common in LPP patients ( $p<0.001$ ). Furthermore, the rate of “no response” at the final visit was significantly higher in LPP patients compared to FFA patients (38.4% in LPP vs. 22.0% in FFA;  $p=0.03$ ).

Although no statistically significant difference in remission rates was observed between the two conditions at the 12-month mark, remission at any point during the follow-up period was significantly more likely in FFA patients than in LPP patients (71.2% in FFA vs. 49.4% in LPP;  $p=0.004$ ). Likewise, remission rates at the last recorded follow-up visit were also significantly higher in FFA patients compared to LPP patients (57.2% in FFA vs. 31.4% in LPP;  $p=0.0006$ ). Relapse rates, whether occurring during ongoing treatment or after treatment discontinuation, did not differ significantly between the two groups.

Intralesional steroids were administered more frequently in FFA patients who achieved complete remission at the 12-month follow-up compared to LPP patients (69.0% in FFA vs. 28.1% in LPP;  $p=0.005$ ). Among systemic therapies, oral minoxidil was used exclusively in the FFA group that achieved

12-month remission, with a significantly higher usage rate compared to the LPP group (31.0% in FFA vs. 3.0% in LPP;  $p=0.0047$ ). No significant differences were noted for other systemic treatments.

Two systemic treatments displayed statistically significant differences between the two conditions: systemic corticosteroids were not utilized in FFA patients who achieved remission, whereas 11.8% of LPP patients received them ( $p=0.0057$ ). Additionally, dutasteride was more commonly prescribed in FFA patients who achieved remission compared to LPP patients (31.4% in FFA vs. 9.1% in LPP;  $p=0.01$ ).

## Discussion

The findings of this study revealed unique patterns in demographic, clinical, and treatment characteristics among patients with FFA and LPP, which were consistent with previous literature.<sup>13,14</sup> The mean age of LPP patients (53.1 years) was comparable to that of FFA patients (45.8 years), highlighting differences in their onset ages. Similar findings were reported by Cerqueira *et al.*,<sup>15</sup> who compared the age of onset of both diseases and found that postmenopausal women over 40 years of age were more susceptible to FFA, whereas LPP predominantly affected an older population (>50 years). These findings suggest differences in the effects of hormonal and environmental factors, which are directly associated with disease onset due to postmenopausal hormonal shifts.

From a pathophysiological perspective, both LPP and FFA are classified as primary lymphocytic cicatricial alopecia. A lichenoid inflammatory infiltrate targets the follicular infundibulum/isthmus and the stem-cell-rich bulge region, promoting the collapse of follicular immune privilege, loss of sebaceous glands, and irreversible follicular destruction followed by perifollicular fibrosis. Proposed drivers include a T helper 1/interferon (Th1/IFN)- $\gamma$ -skewed environment with cytotoxic CD8<sup>+</sup> T-cell activity, activation of the Janus kinase/signal transducers and activators of transcription (JAK-STAT) pathway, and dysregulation of lipid metabolism/peroxisome proliferator-activated receptor (PPAR)- $\gamma$  signaling, all of which may contribute to chronic inflammation and fibrogenesis.<sup>6,7,16</sup>

Despite these shared features, FFA and classic LPP may differ in triggers and modulators that influence their clinical presentation and treatment outcomes. FFA primarily affects women, often peri- or postmenopausal, and the benefit seen with 5-alpha-reductase inhibitors suggests a hormonal/androgen-dependent component in at least some patients. Environmental factors (*e.g.*, leave-on facial products) and autoimmune links have also been proposed, whereas classic LPP is generally regarded as a follicular variant within the lichen planus spectrum, with more variable sex distribution and a tendency for patchy vertex or multifocal scalp disease.<sup>7,9,17,18</sup>

Additionally, the incidence of both FFA and LPP was significantly higher among female populations, consistent with earlier studies. Meinhard *et al.* and Panchaprateep *et al.*<sup>19,20</sup> reported higher incidence rates of FFA among females than males, attributing this to the involvement of female hormonal factors in FFA pathogenesis. Similarly, while LPP also has a higher incidence among females, it has been reported at significant rates among males as well.

This study identified a key similarity in diagnostic delay between the two conditions, as the mean duration from symptom onset to diagnosis was 34 months for both FFA and LPP. Previous studies have reported similar delays in diagnosis, which may be attributed to the slow progression and subtle nature of early symptoms, potentially leading to scarring alopecia.<sup>16,17</sup> These findings underscore the importance of raising awareness among healthcare providers regarding the earliest symptoms of FFA and LPP, which could facilitate early diagnosis and treatment, thereby improving long-term outcomes.

Additionally, a significant difference in the pattern of disease involvement was observed, with body involvement being more common among FFA patients (85.7%) and scalp involvement more frequent among LPP patients (95.9%). These findings align with earlier studies reporting that FFA is more commonly associated with extra-scalp involvement and frontal hairline recession, whereas LPP is typically localized to the scalp.<sup>18,21</sup> Furthermore, this study's findings indicate that diffuse erythema is more common in FFA, while perifollicular erythema is more prevalent in LPP, further distinguishing the two disorders by defining their clinical characteristics.

Higher rates of clinical symptoms such as pain, burning, and pruritus were associated with FFA, whereas LPP exhibited fewer symptoms. Previous research has indicated that FFA is a more symptomatic condition, frequently linked to discomfort and irritation, whereas LPP may present more subtly, with many individuals experiencing no symptoms.<sup>22</sup> These differences in clinical presentation highlight the need for individualized treatment approaches.

Furthermore, this study identified significant differences in treatment approaches between LPP and FFA, particularly in the use of topical and systemic therapies. Corticosteroids and MMF were more commonly prescribed for FFA patients, whereas minoxidil and calcineurin inhibitors were more frequently used for LPP patients. The significantly higher use of topical corticosteroids in FFA patients compared to those with LPP further underscores the importance of managing scalp inflammation in FFA.

The findings of this study revealed significant differences in disease outcomes, such as remission rates, between FFA and LPP patients. Remission rates were significantly higher among FFA patients compared to LPP patients, emphasizing the need for further research on FFA. However, previous studies have

reported the asymptomatic nature and partial treatment responses in LPP patients, underscoring the refractory and chronic nature of this condition.<sup>23</sup>

In our cohort, remission was more common in FFA than in LPP. Several non-exclusive explanations may explain this observation: i) FFA often presents with a recognizable frontotemporal recession and/or eyebrow involvement pattern that can lead to earlier diagnosis and start of treatment; ii) many FFA patients receive disease-modifying antiandrogen therapy (5-alpha-reductase inhibitors) along with anti-inflammatory agents; and iii) classic LPP may show more widespread or fluctuating inflammatory activity, making sustained quiescence more difficult to achieve. Because this was a retrospective study with non-standardized treatment protocols and variable follow-up, these interpretations remain hypothesis-generating. Nonetheless, the expanding therapeutic options, including targeted immunomodulators (*e.g.*, JAK inhibitors) and exploration of energy-based tissue remodeling approaches, warrant future prospective trials. For example, the fractional micro-ablative CO<sub>2</sub> laser has demonstrated promising tissue remodeling and symptom improvement in penile lichen sclerosus, a chronic inflammatory sclerotic disorder, and may provide a conceptual framework for studying adjunctive remodeling treatments in other fibrosing dermatoses after controlling inflammation.<sup>23,24</sup>

## **Conclusions**

Overall, this study found significant differences in the demographic, clinical, and therapeutic characteristics of FFA and LPP patients. The primary similarities between the two conditions were diagnostic delays and treatment approaches, while differences were noted in age of onset, symptomatology, clinical presentation, and treatment outcomes. These distinctions highlight the need for more sensitive diagnostic and treatment strategies. Future research is suggested to further elucidate the pathophysiological differences between FFA and LPP, which could aid in optimizing treatment strategies for both conditions.

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**Table 1.** Demographic characteristics of patients (n=164).

<b>Variable</b>	<b>LPP (n=73)</b>	<b>FFA (n=91)</b>	<b>p-value</b>
Age at onset (years)	53.1±9.42	45.8±10.4	0.02
Female, n (%)	51 (69.9)	73 (80.2)	<0.001
Time for diagnosis (months)	34.6±12.3	34.1±19.9	0.12
Fitzpatrick skin type, n (%)			
I	12 (16.4)	14 (15.4)	
II	9 (12.3)	14 (15.4)	
III	18 (24.7)	34 (37.4)	0.78
IV	24 (32.9)	22 (24.2)	
V	8 (11.0)	6 (6.6)	
VI	2 (2.7)	1 (1.1)	
Ethnicity, n (%)			
Arabs	59 (80.8)	82 (90.1)	0.63
Non-Arabs	14 (19.2)	9 (9.9)	
Residence area, n (%)			0.87
Urban	68 (93.2)	81 (89.0)	
Rural	5 (6.8)	10 (11.0)	
Follow-up (months)	48.1±22.7	48.7±23.5	0.99

LPP, lichen planopilaris; FFA, frontal fibrosing alopecia.

**Table 2.** Clinical characteristics of patients with LPP and FFA.

<b>Variables</b>	<b>LPP, n (%) (n=73)</b>	<b>FFA, n (%) (n=91)</b>	<b>p-value</b>
Scalp involvement	70 (95.9)	59 (64.8)	<0.001
Body involvement	39 (53.4)	78 (85.7)	<0.001
Signs			
Perifollicular erythema	66 (90.4)	71 (78.0)	<0.001
Diffuse erythema	7 (9.6)	35 (38.5)	<0.001
Tubular scaling	51 (69.9)	82 (90.1)	0.09
Symptoms			
Pruritus	19 (26.0)	79 (86.8)	<0.001
Asymptomatic	41 (56.2)	19 (20.9)	<0.001
Burning	5 (6.8)	67 (73.6)	<0.001
Pain	8 (11.0)	43 (47.3)	<0.001
Severity			
Mild	21 (28.8)	24 (26.4)	0.99
Moderate	35 (47.9)	31 (34.1)	<0.001
Severe	17 (23.3)	36 (39.6)	0.15

LPP, lichen planopilaris; FFA, frontal fibrosing alopecia.

**Table 3.** Treatment patterns in LPP vs. FFA (n=164).

<b>Variables</b>	<b>LPP, n (%) (n=73)</b>	<b>FFA, n (%) (n=91)</b>	<b>p-value</b>
Systemic treatments			
Hydroxychloroquine	58 (79.5)	76 (83.5)	0.37
Tetracyclines	41 (56.2)	61 (67.0)	0.44
Corticosteroids	4 (5.5)	18 (19.8)	<0.001
Minoxidil	11 (15.1)	6 (6.6)	<0.001
Retinoids	11 (15.1)	18 (19.8)	0.65
Cyclosporine	2 (2.7)	3 (3.3)	0.97
MTX	9 (12.3)	10 (11.0)	0.12
MMF	2 (2.7)	9 (9.9)	0.05
Topical treatments			
Corticosteroids	57 (78.1)	90 (98.9)	<0.001
Minoxidil	55 (75.3)	11 (12.1)	<0.001
Calcineurin inhibitors	49 (67.1)	25 (27.5)	<0.001
Antibiotics	5 (6.8)	6 (6.6)	0.24
Intralesional steroid	39 (53.4)	47 (51.6)	0.08

LPP, lichen planopilaris; FFA, frontal fibrosing alopecia; MTX, methotrexate; MMF, mycophenolate mofetil.