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Original Research Article

Clinicopathological, trichoscopic and biochemical parameters in females with patterned hair loss

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ABSTRACT

Background: Hair has no vital functions in humans but its loss from the scalp can create a sense of negative body image and anxiety. The term 'female pattern hair loss' is explained by decrease in hair fiber production and their eventual miniaturization. To evaluate the clinicopathological, trichoscopic and biochemical parameters in females with patterned hair loss.
Methods: 37 females in age group of 18-45 years complaining of reduction in hair volume with diffuse thinning over the crown were included in our study after applying inclusion and exclusion criteria. Detailed history was taken and clinical examination was done. Written consent and ethical clearance from Institutional Ethical Committee was taken. Ludwig grading, evaluation of other clinical signs of hyperandrogenism and trichoscopy was done. These females then underwent histopathological examination. 10 ml blood was withdrawn to assess anemic, thyroid and hormonal profile in these females.
Results: Out of 37 females examined majority of the females had Ludwig grade 1 hair loss. Serum levels of testosterone were found significantly related to clinical signs of hyperandrogenism. Hair diameter variability and peri pilar sign formed the majority in trichoscopy (62.2% each). The most common histopathological finding was perifollicular infiltrate (70.3%).
Conclusions: FPHL can contribute to severe psychological distress. Despite its high prevalence, its diagnosis and treatment still impose several difficulties in clinical practice. Although hormonal factors are believed to contribute, its pathogenesis still remains elusive.

Keywords: Female pattern hair loss, Histopathology, Trichoscopy, Hormonal profile

INTRODUCTION

Hair loss in males although distressing has been socially accepted for long time whereas a woman's hair is considered central to her femininity creating a sense of poor body image.

Female pattern hair loss (FPHL) is a non-scarring diffuse alopecia resulting from progressive miniaturization of hair follicles and subsequent reduction in the hair volume.[1]

FPHL has its onset in reproductive years and its prevalence increases with age. The role of androgens in male androgenetic alopecia is principally established by the presence of its receptors on dermal papilla while their role in FPHL is yet to be proven.[2]

The diagnosis of FPHL still imposes several difficulties in dermatological practice due to its close resemblance with chronic telogen effluvium. However detailed history, trichoscopy and histopathological examination serve as important tools in making the final diagnosis.

METHODS

An observational study was conducted in the out-patient clinic of R.D. Gardi Medical College, Ujjain from September 2020 to October 2021 to evaluate the clinicopathological, trichoscopic and biochemical parameters in females with patterned hair loss. Detailed history regarding onset, duration, progression, medical and family history was taken. Thorough clinical examination was done to look for specific features of patterned baldness like diffuse thinning over crown and increase in central parting. Clinical signs of hyperandrogenism including acne vulgaris, menstrual irregularities, hirsutism and acanthosis nigricans were evaluated.

Trichoscopic examination was done using handheld Dermlite DL4 dermoscope (10x) and digital photographs were taken using iPhone XR.

For assessment of biochemical parameters, 10 ml of venous blood was withdrawn preferentially on 3rd to 5th day of menstrual cycle to assess for Hb%, serum ferritin, serum total/free testosterone, serum prolactin and TSH levels.

For histopathological examination, a 4 mm punch biopsy was obtained from crown after cleaning the area thoroughly with spirit and injecting 2% plain lignocaine. Single suture and sterile dressing were applied and patient was asked to keep the wound dry. The specimen was kept in 10% formalin solution and hematoxylin and eosin staining was done findings were summarized and discussed in detail.

RESULTS

Out of 37 cases examined for female pattern hair loss, majority of them belonged to the age group of 37-45 years (48.6%). The mean age of presentation was found to be 33.9±7.8 years.

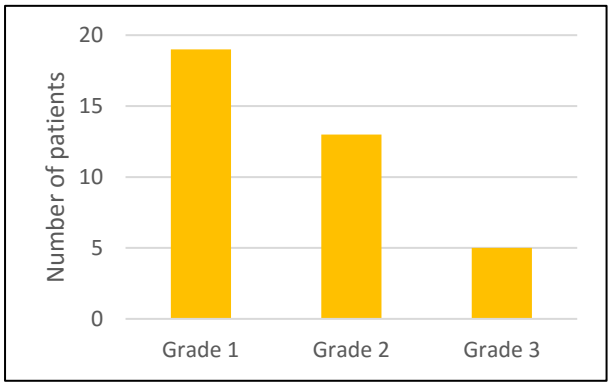

Figure 1: Distribution of females according to Ludwig grade.

The mean duration of hair loss noted was 4.32 years in our study. Family history was positive in first degree relative of 40.5% females. It was found maximum in the age group of 18-26 years and it was least in females with late onset of presentation.

Table 1: Correlation between Ludwig grading with age and duration of hair loss.

Spearman's rho		AGE	Duration	Duration category
Ludwig Grade	*r*	0.619	0.573	0.664
	p value	0.001 (S)	0.001 (S)	0.001 (S)

Table 2: Mean values of biochemical parameters.

Variable	N	Min	Max	Mean	SD
Age	37	19	44	33.92	7.77
Duration	37	1	8	4.32	1.96
Hb	37	8.2	15.2	12.99	1.70
Ferritin	37	24.3	230.2	101.15	49.94
TSH	37	0.5	10.4	2.54	2.13
Testosterone	37	5.71	220.2	63.19	42.66
Prolactin	37	3.8	44.8	14.38	9.72

Table 3: Correlation between clinical evidence of hyperandrogenism and biochemical parameters.

	Correlation of clinical signs of hyperandrogenism with biochemical parameters				
	Testosterone level	**Prolactin level**	**Hb**	**Ferritin**	**TSH**
r	0.515	0.108	0.1	0.148	0.156
P value	0.001*	0.527	0.556	0.381	0.356
Significance	S	NS	NS	NS	NS

Most common Ludwig grade in our study was grade 1 in 19 patients. (51.4%). (Figure 1) (Table 1) (Figure 1)

Age and duration of hair loss were positively correlated with Ludwig grade ($r=0.619$, $p<0.05$; $r=0.573$, $p<0.05$).

Total number of patients showing clinical evidence of hyperandrogenism were 18 (48.6%). Most common clinical evidence of hyperandrogenism found in our study was acne and menstrual irregularities in 14 (37.8%) and 12 (32.4%) females respectively whereas only 2 (5.4%) females showed acanthosis nigricans. (Table 2)

Point biserial correlation showed that testosterone was significantly correlated with clinical signs of hyperandrogenism ($p<0.05$) while prolactin, Hb, ferritin and TSH had $p>0.05$. (Table 3)

Table 4: Distribution of patients according to trichoscopy findings.

Trichoscopy findings	Present		Absent	
	n	%	n	%
Hair diameter variability	23	62.2	14	37.8
Peri pilar sign	23	62.2	14	37.8
White dots	15	40.5	22	59.5
Scalp pigmentation	17	45.9	20	54.1
Focal atrichia	15	40.5	22	59.5

Table 5: Distribution of patients according to histopathological findings.

Histopathological finding	Present	Absent
Perifollicular infiltration	26 (70.3%)	11 (29.7%)
Miniaturization of hair follicle	21 (56.8%)	16 (43.2%)
Perifollicular fibrosis	10 (27%)	27 (73%)
Increase in telogen hair	16 (43.2%)	21 (56.8%)

Table 6: Comparison of clinical signs of hyperandrogenism with other studies.

	Present study	Tandon et al[5]	Cela et al[7]	Moltz et al[8]
Acne	37.8%	36.6%	43%	41.6%
Menstrual irregularity	32.4%	-	-	-
Hirsutism	16.2%	66.66%	-	-
Acanthosis nigricans	5.4%	43.3%	-	-

Most common trichoscopy finding found in our study was variation in hair shaft diameter and peri pilar sign in 23 (62.2%) females. (Table 4) (Figure 2)

Most common histopathological finding found in our study was perifollicular infiltration in 26 (70.3%) females whereas the least common finding present was perifollicular fibrosis in only 10 (27%) females. (Table 5) (Figure 3)

Evaluation of histopathological findings was done in different grades of hair loss. Fischer's exact test and Cramer's V test were applied to know the presence of any association between a specific histopathological finding and grade of hair loss. Perifollicular fibrosis showed significant association with Ludwig grading with a p-value of 0.001 (<0.05) while other findings showed no significant association with grade of hair loss.

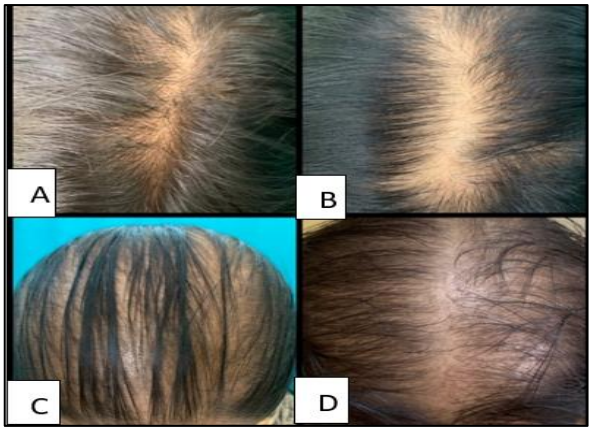

Figure 1: Ludwig clinical grading of FPHL. (A) Grade 1: Thinning of the hair from the anterior part of crown with minimal widening of the central parting. (B) Grade 2: It is characterized by more pronounced rarefaction on crown and increase in the number of thinner and shorter hair. Camouflage is no longer possible. (C) Grade 3: It is generally seen after menopause and the crown may literally become bald. (D) Grade 3.

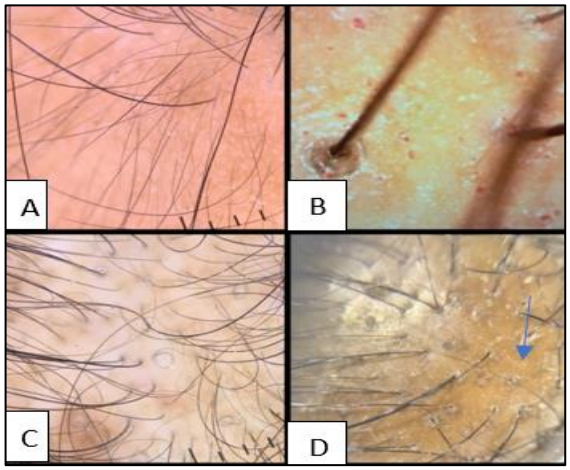

Figure 2: Trichoscopy findings in FPHL. (A) Hair diameter variability. (B) Peri pilar sign: Brown coloured atrophic area around the follicle usually occurring in early stages and correlates with the inflammatory infiltrate. (C) Focal atrichia: It is noted in advanced stages of FPHL with complete atrophy of pilosebaceous units. (D) Scalp pigmentation: patchy honeycomb pattern due to greater penetration of ultraviolet radiation through thin hairs.

DISCUSSION

According to the results obtained, the most common age group presenting with female pattern hair loss was 37-45 years (48.6%) whereas 24.3% and 27% females were found in age group of 18-26 years and 27-36 years respectively. Gan and Sinclair also suggested that clinical presentation of FPHL increases with age.[3] The mean age of presentation in our study was found to be 33.9±7.8

years. This was in concordance with the study of Zhang et al conducted in 60 patients of Chinese background having the mean age of 34±10.6 years whereas the mean age of presentation was found to be 31.17 years in an Indian study of Tandon et al conducted at RML Hospital, New Delhi.[4,5]

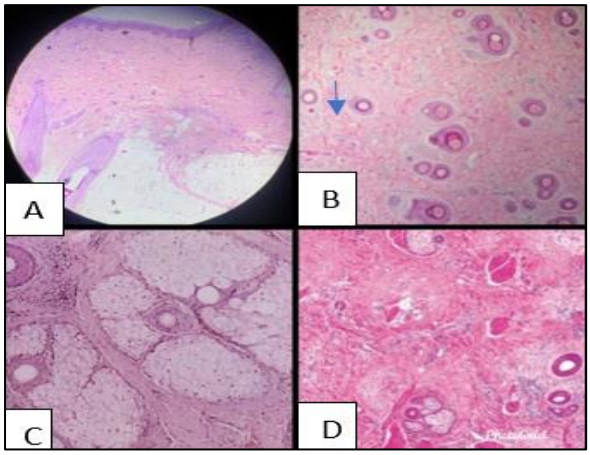

Figure 4: Histopathological findings in FPHL. (A) Peri follicular infiltration. (B) Miniaturization of hair follicle. (C) Peri follicular fibrosis. (D) Variability in hair shaft diameter.

Maximum number of females (48.6%) had the complaint of hair loss for 4-6 years. The mean duration of hair loss was found to be 4.3±2 years in our study. This was concordant with the study conducted by Zhang et al having the mean duration of 4.49±3.76 years while the study conducted by Tandon et al showed the mean duration of 5.1 years. [4,5]

In our study family history was found to be positive in 40.5% females while it was found to be 46% in the study of Tandon et al, 45% in Zhang et al and 45.2% in a study conducted by Paik et al in Korean women.[4-6] Family history was found to be positive in 88.88% females belonging to the age group of 18-26 years while 5.4% females had the positive history in the age group of 37-45 years showing the earlier onset of hair loss in these females. This was concordant with the study of Zhang et al having maximum females with positive family history in the age of 23.5±6.5 years.[4]

Maximum number of females (51.4%) showed Ludwig grade 1 hair loss followed by grade 2 in 35.1% females. This was concordant with the study conducted by Zhang et al having majority of females (40%) in Ludwig grade 1 category.[4]

In our study the grade of hair loss was found to be positively correlated with age of presentation ($r=0.619$, $p<0.05$) and duration of hair loss ($r=0.573$, $p<0.05$) as in the study conducted by Zhang et al.[4]

Clinical evidence of hyperandrogenism was found in 48% females in our study. Most common feature found was acne (37.8%) followed by menstrual irregularities in 32.4% females. This was discordant with the study conducted by Tandon et al having the most common clinical evidence as hirsutism in 66.66% females followed by acanthosis nigricans in 43.3%.[5] (Table 6)

Biochemical parameters assessed were Hb%, ferritin, TSH, testosterone and prolactin levels. Mild deviation in TSH was found in 5.4% females in our study whereas it is found to be 3.33% in the study of Zhang et al.[4] In our study, significant association was found between females having clinical evidence of hyperandrogenism and testosterone levels ($p=0.001$). Therefore females with clinical evidence have higher chances of having deranged biochemical parameters. However, correlation tests did not reveal any association between Ludwig grading and biochemical parameters ($p>0.05$). This was in agreement with the study conducted by Tandon et al.[5]

Hair diameter variability and peri pilar sign were found in maximum number of females in our study (62.2%). This was in agreement with the study conducted by Tosti et al showing variability in thickness as the most common finding.[9] However, Zhang et al found scalp pigmentation as the most common trichoscopy finding with significant association of trichoscopy findings and grade of hair loss.[4]

Most common histopathological finding found in our study was perifollicular infiltration in 70.3% females followed by miniaturization of hair follicles in 56.8%. This finding was discordant with the study of Tandon et al having increase in telogen hair as the most common histopathological finding.[5] However, our study was concordant with the study of Whiting et al having moderate to severe perifollicular infiltrate whereas the study conducted by Lattanand et al showed miniaturization of hair follicles as the most common finding.[10,11]

Histopathological findings were not found to be significantly associated with Ludwig grading ($p>0.05$) except for perifollicular fibrosis ($p=0.001$) in our study.

CONCLUSION

Despite the high prevalence of FPHL, its diagnosis still imposes several difficulties to dermatologists in clinical practice. Although it is considered a counterpart of androgenetic alopecia in males, definitive evidence is still lacking. It imparts significant psychosocial impact on females creating a sense of anxiety and poor body image. Detailed history, clinical examination, histopathology, trichoscopy and evaluation of biochemical parameters are important to make a definite diagnosis. It closely mimics other causes of alopecia especially chronic telogen effluvium further necessitating the need for detailed evaluation. Although assessment of these parameters is

not needed routinely in all the cases except in cases with clinical evidence of hyperandrogenism like hirsutism, acne, menstrual irregularities and acanthosis nigricans suggesting that there is a role of hormones in its pathogenesis but larger studies are required to adequately understand its pathophysiology.

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Ethical approval: The study was approved by the institutional ethics committee

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