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A CROSS SECTIONAL DESCRIPTIVE STUDY TO INVESTIGATE THE PATTERN AND GRADING OF FEMALE PATTERN HAIR LOSS IN POLYCYSTIC OVARIAN SYNDROME PATIENTS.

Dermatology

Dr Satyaprakash Misra* Junior Resident Dermatology, Venereology & Leprology, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, U.P. *Corresponding Author

Dr Tarang Goyal Professor & Head Dermatology, Venereology & Leprology, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, U.P.

Dr Swati Gupta Associate Professor Dermatology, Venereology & Leprology, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, U.P.

Dr Sumit Sehgal Assistant Professor Dermatology, Venereology & Leprology, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, U.P.

Dr Kapil Arora Associate Professor Dermatology, Venereology & Leprology, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, U.P.

ABSTRACT

Introduction: Polycystic ovary syndrome (PCOS) is a prevalent endocrine disorder affecting reproductive-aged women, characterized by hormonal imbalances and various reproductive manifestations. Female pattern hair loss (FPHL) is increasingly recognized as a common dermatological manifestation in PCOS patients, adding to the complexity of its clinical presentation. **Aims And Objectives:** This study aimed to evaluate the pattern and grading of FPHL in patients diagnosed with PCOS using Rakowska's Dermoscopic criteria and Ludwigs Classification. Additionally, demographic features and clinical manifestations associated with PCOS were assessed. **Methods:** A cross-sectional descriptive study was conducted on 640 female patients diagnosed with PCOS according to modified Rotterdam criteria. Among them, 80 patients were evaluated for FPHL using Rakowska's dermoscopic criteria. Demographic data, clinical features including hirsutism, polycystic ovarian morphology (PCOM) on ultrasonography, irregular menstruation, acne, and serum testosterone levels were documented. FPHL was graded using the Ludwigs Classification based on the extent of hair loss. Dermoscopic findings such as hair miniaturization, hair shaft diameter diversity, single hair follicular units, peri-pilar sign, yellow dots and presence of vellus hair were recorded. **Results:** The study found that FPHL was present in 12.5% of PCOS patients evaluated. The majority of these patients were between 20-30 years old (88.75%), highlighting a younger age distribution. Clinical features commonly associated with PCOS included hirsutism (83.12%), PCOM (57.96%), irregular menstruation (65.31%), acne (50%), and elevated serum total testosterone levels (>75 ng/dL in 25% of patients). In terms of FPHL grading, 62.5% of cases were classified as Ludwig Grade II, indicating moderate hair loss. Dermoscopic analysis revealed hair miniaturization (97.5%), hair shaft diameter diversity (>20% in 100%), single hair follicular units (53.75%), and presence of vellus hair (67.5%) as predominant features. Yellow Dots at 22.5% and peri pilar sign at 17.5% were some of the other dermoscopic findings. **Conclusion**-This study highlights the significant association between PCOS and FPHL, particularly among younger women. The findings emphasize the importance of early detection and management of FPHL in PCOS patients, utilizing dermoscopy for accurate diagnosis and monitoring.

KEYWORDS

Polycystic ovarian syndrome(PCOS), Female pattern hair loss(FPHL), Polycystic Ovarian Morphology(PCOM), Hair Diamter Diversity (HDD).

INTRODUCTION-

Polycystic Ovary Syndrome (PCOS) is a common endocrine disorder affecting women of reproductive age. It is characterized by a complex interplay of hormonal imbalances, metabolic dysregulation, and genetic factors [1]. The clinical presentation of PCOS is diverse, often encompassing irregular menstrual cycles, hyperandrogenism, and polycystic ovarian morphology on ultrasound. The Modified Rotterdam Criteria, widely used for PCOS diagnosis, require the presence of at least two of the following three features: oligo-anovulation, hyperandrogenism (clinical or biochemical), and polycystic ovarian morphology [2].

Hyperandrogenism, a hallmark of PCOS, results in elevated levels of androgens, such as testosterone. These excess androgens can lead to a variety of clinical manifestations, including hirsutism, acne, and androgenetic alopecia (female pattern hair loss). Female Pattern Hair Loss (FPHL) often leads to significant psychological distress. It is characterized by progressive thinning of hair, particularly at the crown and part line of the scalp. While various factors can contribute to FPHL, hormonal imbalances, particularly those associated with Polycystic Ovary Syndrome (PCOS), play a crucial role. Hyperandrogenism is a key factor linking the two conditions. Elevated androgen levels, particularly testosterone, can disrupt the hair growth cycle, leading to miniaturization of hair follicles and ultimately, hair loss[3].

Dermoscopy, a non-invasive diagnostic tool, has emerged as a valuable aid in the clinical evaluation of hair loss conditions, including Female Pattern Hair Loss (FPHL). By magnifying the scalp surface, dermoscopy allows for a detailed examination of hair follicles and their surrounding structures.

Rakowska's criteria is a set of dermoscopic findings used to diagnose Female Pattern Hair Loss (FPHL). This diagnostic tool helps clinicians identify specific patterns on the scalp. Key features include yellow dots, which are small, yellow-colored structures representing miniaturized hair follicles; thinning hair, characterized by a decrease in hair density; vellus hairs, which are fine, short, and often colorless hairs; and increased hair diameter variability, where a mix of thick and thin hairs is observed. By recognizing these dermoscopic features, clinicians can accurately diagnose FPHL and initiate appropriate treatment[4].

Aims And Objectives-

Aim : A hospital based cross sectional descriptive study to investigate the pattern and grading of Female Androgenetic Alopecia in patients of PCOS.

Objectives :

1. To study the pattern of Female Androgenetic alopecia in PCOS patients using the Rakowska's dermoscopic criteria.
2. To study the grading pattern of female androgenetic alopecia in PCOS using the Ludwig grading system at Muzzafarnagar medical college, Muzzafarnagar within a fixed time limit.

MATERIALS AND METHODS-

A hospital based cross sectional descriptive study was conducted in Department of Dermatology, Venereology and Leprology, Muzaffarnagar Medical College & Hospital , Muzaffarnagar (UP), on all OPD patients presenting with PCOS or symptoms of PCOS who were then evaluated as per Modified Rotterdam criteria and diagnosed with PCOS. 640 patients of PCOS were identified. These patients were then evaluated for hair loss using Rakowska's dermoscopic analysis and Ludwig grading scale to identify the pattern and grading of FPHL

after taking informed consent from July 2022-May 2023.

Detailed case history was taken from each patient regarding PCOS like irregular menses, acne, hirsutism along with extent and site of hair loss, duration of hairloss, any previous history of similar episodes and any family history of hair loss in a preformed working proforma. Thorough clinical evaluation was done for the Site of hairloss, morphology and extent of hairloss along with detailed general, physical and dermatological examination.

Dermoscopic evaluation was done using Dino Lite dermoscope in all diagnosed patients of PCOS who reported hairloss. Hair Diameter Diversity and other detailed examinations were performed using the Dino Lite dermoscope. The main dermoscopic features of FPHL are a hair diameter diversity(HDD) of >20% and presence of Hair Miniaturization. Hair diameter diversity was assessed at a point 2 cm from the frontal hair line in the midline and is compared with the occipital scalp. The process involving quantification of HDD involves examination of scalp about 2 cm behind the hairline with a 10x magnification dermoscope. The total hair follicles in a defined area are counted and categorize them as thick terminal (normal) or thin vellus (miniaturized) hairs. The number of vellus hairs are divided by the total count of hairs and multiply by 100 to get HDD percentage. Appropriate pre-formed proforma was used for the data collection from eligible participants.

Inclusion Criteria:

1. Women who has attained Menarche .
2. The patients who fulfilled the criteria of PCOS as defined by the Rotterdam Criteria were taken up for the study.

Exclusion Criteria:

1. Patients with Menopause and non menstruating women.
2. Patients with active scalp infection.
3. Pregnant women.
4. Patients with scarring alopecia.
5. Patients with patchy alopecia.
6. Lactating women .
7. Patients who underwent chemotherapy in last 1 year .

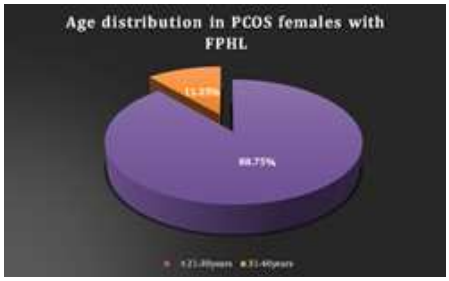
The data was consolidated and summarized in an Excel spreadsheet under the supervision of a statistician. The data was entered in a Microsoft Excel spread sheet and analyzed by Statistician . The software utilized for analysis was SPSS 22.0 on Windows, developed by SPSS Inc. in Chicago, USA.

RESULTS-

Table 1- Age Distribution In Pcos Females With Fphl(N=80 Out Of 640)

Age Groups	Frequency	Percentage
20-30 years	71	88.75%
31-40 years	9	11.25%
Total	80	100

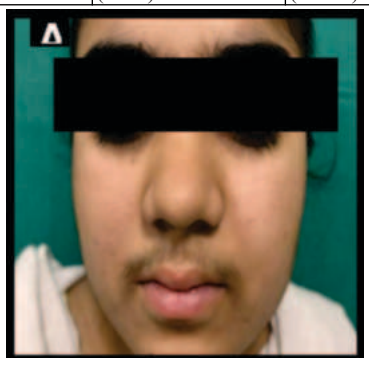
Table: 1 shows the age wise distribution of female patients with PCOS. Maximum number of patients (88.75%) were in the age group of 20 – 30 years.



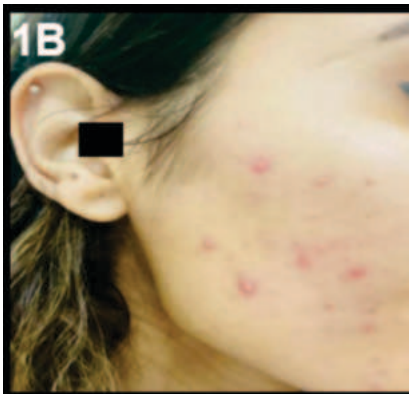
Graph-1 shows the age distribution in pcos females with FPHL. 88.75% of patients belonged to the 20-30 age group.

Table 2- clinical features in patients with coexisting PCOS and FPHL (n=80) versus PCOS alone(n=640)

Site	PCOS PLUS FPHL(n=80)	PCOS ALONE(n=640)
PCOM	(n=59)73.75%	(n=371)57.96%
Hirsutism	(n=70) 87.5%	(n=532)83.12%
Acne	(n=34)42.5%	(n=320)50%
Patterened hair loss	Cases included in the study	(n=80)12.5%
Irregular periods	(n=60)75%	(n=418)65.31%

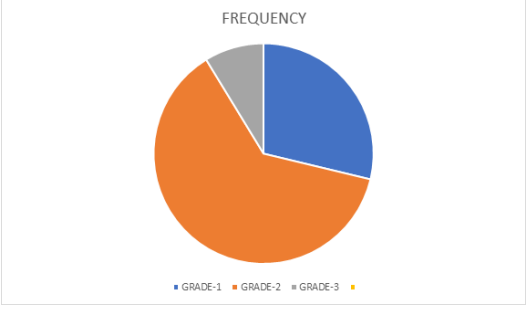


Hirsutism



Acne

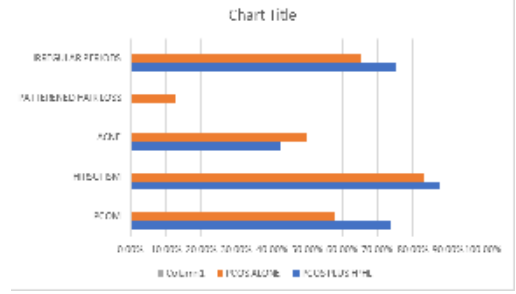
Figure-1A and 1B showing features suggestive of Hirsutism and Acne respectively.



Graph-2 clinical features in patients with coexisting PCOS and FPHL (n=80) versus PCOS alone(n=640)

Table-3 discusses about the Ludwig Grading of hairloss in patients with FPHL.

STAGE	FREQUENCY	PERCENTAGE
GRADE-1	23	28.75%
GRADE-2	50	62.50%
GRADE-3	7	8.75%



Graph-3 Showing The Distribution Of The Grading Of Hairfall As Per The Ludwigs Grading.


Figure-2a

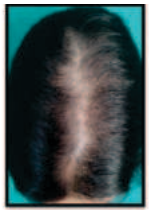


Figure-2b

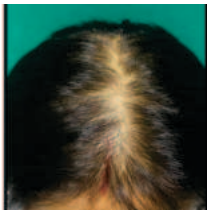


Figure-2c


Figure-2d

Figure 2 : (2A) Ludwig Grade I in Female pattern hair loss characterised by mild thinning of the hair on top of scalp and slight widening of central parting . (2B) & (2C) Ludwig Grade II in female pattern hair loss in christmas tree pattern characterised by moderate thinning of hair loss and noticeable widening of central parting(2D) Ludwig Grade III in female pattern hair loss.

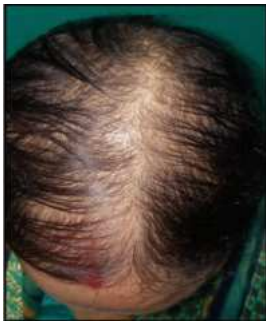


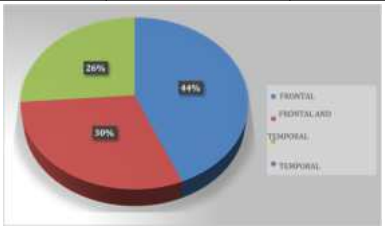
Figure-3 Shows The Ludwigs Grade-3 Stage Of Hairfall In A Patient Of Fphl.

Table 4: Positivity for serum total testosterone in patients with PCOS alone (n=80).

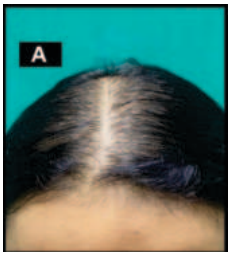
	Frequency (n=80)	Percentage
Sr total Testosterone(>75ng/dl)	20	25%

Table 5 : Site Of Scalp Involvement In Female Pattern Hair Loss (n=80).

SITE	Frequency (n=80)	Percentage
Frontal	35	43.75%
Frontal and Temporal	24	30%
temporal	21	26.25%



Graph-4 : Frontal Area Of The Scalp Was The Most Affected Area (43.75%) Followed By Frontal And Temporal Area With A 30% Score.



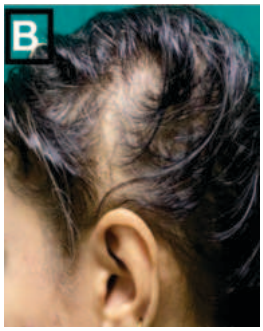


Figure 4 : (4A) Involvement of frontal area(43.75%) of scalp in FPHL (4B) Involvement of temporal area in FPHL, 26.25% of PCOS patients exhibited pattern hair in temporal regions.

Table 6: Dermoscopic Findings In Female Pattern Hair Loss (n=80)

FEATURES	Frequency	Percentage
Yellow dots	18	22.5%
Hair shaft diameter diversity	80	100%
Peripilar Sign	14	17.5%
Hair Miniatirization	78	97.5%
Single Hair containing	43	53.75%
Vellus hair	54	67.5%

Graph-5 showing us the major dermoscopic findings in FPHL.

Dermoscopic Findings In Fphl

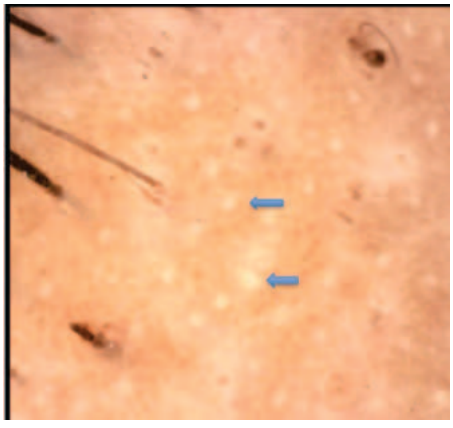


Figure-5

Figure 5 : Dermoscopic examination of FPHL- 3-4groups of regularly distributed yellow dots (blue arrow).

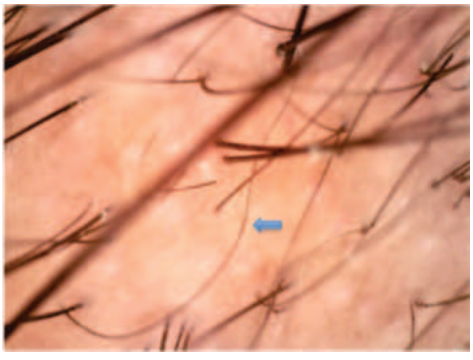


Figure-6

Figure -6: Dermoscopic examination of FPHL revealing Hair shaft diameter diversity along with few vellus hair (blue arrow) .

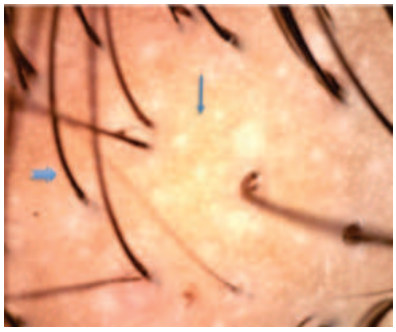


Figure-7

Figure 7: Dermoscopic examination of FPHL revealing 2-3 group of yellow dots along with single hair follicular units (blue arrow) with honey comb appearance(line arrow) suggestive of chronic stage of FPHL.

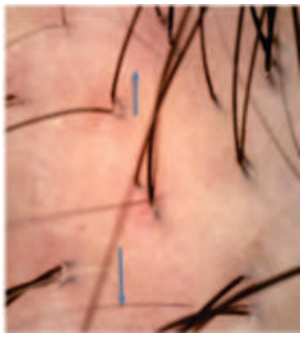


Figure-8

Figure 8: Dermoscopic examination of FPHL showing single hair follicular units(blue arrows) along with miniaturized hairs.

Figure-9

Figure-9: Dermoscopic examination of FPHL patients showing vellus hairs(blue arrow) which are non pigmented.

Figure-10

Figure 10 – Dermoscopic examination of FPHL revealing peri pilar sign(blue arrow) in form of hyperpigmentation seen around the base of the hair follicles

DISCUSSION-

In present study, the age distribution of females with PCOS and FPHL reveals a concentration in younger age groups, with a significant majority observed between 20 to 30 years old. Among the 80 patients diagnosed with both PCOS and FPHL, 71 (88.75%) fell within the 20-30 years age range, while 9 (11.25%) were between 31-40 years old. The predominance of cases among younger women aligns with the typical age of onset for both PCOS and FPHL. PCOS commonly manifests during reproductive years, characterized by irregular menstrual cycles, hyperandrogenism, and insulin resistance, which contribute to the development of FPHL [5 , 6]. Hormonal imbalances in PCOS may worsen hair loss during reproductive years. The higher prevalence in younger women might be due to early diagnosis or increased awareness. Lower frequency in older women could be related to post-menopause symptom resolution or underdiagnosis.

Clinical Features In Patients Of Pcos:

Our study investigated various clinical features in patients diagnosed with both PCOS and Female Pattern Hair Loss (FPHL), highlighting distinct characteristics compared to those with PCOS alone.

Polycystic Ovarian Morphology(PCOM):

PCOM is characterized by the presence of multiple small follicles in the ovaries, arranged peripherally. This morphology can be visualized using transvaginal ultrasound, where the ovaries may appear enlarged and contain 12 or more follicles measuring 2-9 mm in diameter, and/or increased ovarian volume (>10 ml) in one or both ovaries **[7]**. Among PCOS patients with FPHL, 73.75%(n=59) showed PCOM for PCOS . In contrast, 57.96% (n=371) of PCOS only were found to have PCOM findings.This suggests a potential association between more severe phenotypes of PCOS, as evidenced by ultrasonographic criteria, and the presence of FPHL.

Study by **R Deswal R et al. [8]**, found 35% of patients to have PCOM on ultrasonography. Another cross sectional study by **Zandi S et al. [9],** PCOM was seen in 48.3%(n=57) of the cases.

Study by **Van der S et al. [10],** comprised of 90 patients clinically suspected of having PCOS, ultrasonographic findings revealed that 74 patients (82.22%)exhibited polycystic ovaries morphology, while 16 patients(17.77%) showed no ovarian abnormalities. . Variations in ultrasound equipment and interpretation criteria can influence PCOM prevalence rates across studies **.**

Hirsutism:

The MFG score assesses hair growth across nine body areas sensitive to androgens: upper lip, chin, chest, upper and lower back, upper and lower abdomen, upper arm, and thigh. A score of 0 indicates no terminal hair growth, while a score of 4 indicates significant growth. Hirsutism is defined as a total score of 8 or more **[11]** .The presence of hirsutism, a common androgen-related symptom, was reported in 87.5%(n=70) of PCOS patients with FPHL . In comparison, 83.12%(n=532) of PCOS patients alone also experienced hirsutism. This suggests the role of androgen excess in both hirsutism and coexistent FPHL and PCOS patients.

Study by **Choudhary A et al's. [12]** , stated that hirsutism was observed in 64.2% (45 out of 70) of patients. **R Deswal et al's. [8]** cross-sectional study reported positive findings indicative of hirsutism in 30% of patients. **Zandi S et al's. [9]** cross-sectional study documented the prevalence of hirsutism in 54% of the patients(n=118).

Variability in the definition and inclusion of clinical versus subclinical hirsutism can lead to differences in reported prevalence rates. Subclinical hirsutism refers to milder forms that may not meet all diagnostic criteria but can still affect the individuals.

Acne:

- Acne was noted in 42.5%(n=34) of PCOS patients with FPHL , while it affected 50% (n=320)of total PCOS patients. This disparity may reflect varying degrees of androgen sensitivity and the complex interplay of hormonal factors contributing to dermatological manifestations in PCOS.
- As per a meta analytical study by **Ramezani F et al. [13],** the combined prevalence of acne was found to be 43% (95% CI: 41–45%) among women with PCOS. Specifically, adults with PCOS had a pooled acne prevalence of 42%, whereas adolescents with PCOS had a higher prevalence of 59%, both significantly

elevated compared to their non- PCOS counterparts. In Study by **Choudhary A et al. [12],** acne was documented in 41 out of 70 patients (58.57%).Androgen sensitivity can amplify acne in individuals with both PCOS and FPHL, potentially due to variations in PCOS phenotypes

2. Irregular Periods:

- Irregular menstrual cycles, indicative of hormonal dysregulation, were observed in 75%(n=60) of PCOS patients with FPHL. In contrast, 65.31%(n=418) of total PCOS patients reported irregular periods. This highlights the impact of hormonal imbalances associated with PCOS on both reproductive health and dermatological conditions such as FPHL.
- Study by **Zandi S et al. [9],** showed 37%(n=118) of the patients suffered from irregular menstruationin PCOS patients.
- Another Study by **Choudhary A et al. [12],** concluded the prevalence of irregular periods to be at 68.57%(n=70) in PCOS patients.
- Factors such as diet, physical activity levels, and stress can influence the severity of PCOS symptoms and hormonal imbalances. Lifestyle choices that exacerbate insulin resistance or promote androgen production may worsen both PCOS and FPHL symptoms.

The incidence of FPHL among PCOS patients was documented to be at 12.5%(n=80)in our study. Study by **Enrico et al. [15]** which comprised of a meta analysis and systemic review described the incidence of coexistent FPHL + PCOS to range between 20-30%. The reason behind the data mismatch could be because the studies included for meta analysis and systematic review included people from different geographic locations from all over the globe.

Study conducted by **Su et al. [16]** in Taiwan, where it was observed that there was a prevalence of FPHL of 11.8%. The findings of this study gels with our study. The reason could be that the study accounted for Asian population and thus similar results were recorded.

O"tar T et al. [17] conducted a study where investigators examined a large sample of white women (n = 1006), including patients in a dermatology clinic as well as individuals from the surrounding community, and found a rate of FPHL of 19% for the overall population, ranging from 3% for women in their 20s, 17% for women in their 30s, and 23% for those in their 50s . The findings in this study were inconsistent with our findings. The possible cause could be the different demographic sample (white women) taken into consideration. Differences in the prevalence of FPHL between ethnic groups may depend on genetic differences in molecular action and biochemistry of several factors that regulate hair growth.

DISCUSSION

Positivity for Serum Total Testosterone in patients with PCOS:

The investigation of Serum Total Testosterone levels among patients diagnosed with PCOS was that 25%(n=80) of the patients exhibited elevated concentrations (>75 ng/dl).

Study by **Abdelazim I et al. [18]** , Total Testosterone was found to be significantly high(92.5+-9.1) with (n=119) with a P-value of 0.001* with 95% CI.

Three studies**, Nidhi et al. (2.8%) [19], Deswal et al. (2.7%) [20],** and **Kusuma et al. (12.3%) [21**], provided data on the percentage of females exhibiting biochemical hyperandrogenism. Clinical Heterogeneity can manifest as Variability in the clinical presentation and severity of hyperandrogenism among study populations and can affect prevalence rates. Differences in the inclusion criteria for defining hyperandrogenism (e.g., clinical symptoms, biochemical markers) can lead to varying estimates across studies. Differences in how data are interpreted, analyzed, and reported (e.g., reporting mean values vs. Percentages) can influence the comparability of findings across studies subset. Conversely, the lower frequency in older age groups could indicate either resolution of symptoms post-menopause or underrepresentation due to different diagnostic challenges in older women with PCOS.

Grading Of FPHL+PCOS

Using the Ludwig scale with (n=80), we found that most patients were classified as Grade II, making up 62.5% (50 out of 80). Grade II shows more noticeable thinning or sparse hair on the crown compared to Grade I. This means the affected area in Grade II covers the same region as Grade I but with more visible scalp due to hair loss, indicating moderate hair loss among these patients.

Grade I accounts for 28.75% (23 out of 80), characterized by visible thinning of hair on the crown, extending up to 1-3 cm behind the frontal hairline. Hair loss is noticeable but not extensive.

Grade III represents 8.75% (7 out of 80), indicating a smaller proportion with severe hair loss. Grade III is the most advanced stage of FPHL, where there is complete baldness or total loss of hair within the areas affected in Grades I and The scalp becomes prominently visible due to significant hair loss, showing extensive and progressive thinning of hair follicles across these regions. **Chaikittisilpa et al. [22]** reported a prevalence of FPHL at 52.2% (95% CI, 44.6- 59.8). They observed FPHL severity by Ludwig grades I, II, and III was 73.2% (95% CI, 62.9-81.8), 22.6% (95% CI, 14.6-32.4), and 4.2% (95% CI, 1.2-10.7), respectively, indicating varying degrees of hair loss severity. Similar results were seen in a study by **Ramos et al. [23]** reported 68% in grade I, 26% in grade II and 6% in grade III which did not match with the findings of our study.

The discrepancy among data in Ludwig's grading could be attributed to the fact that there exist a time gap between presentation of disease and treatment seeking behaviour among patients due to variable reasons like busy lifestyle, financial concerns, social stigma and many more.

Regions Involved In Scalp-

A notable percentage of patients, 43.75% (35 out of 80), displayed Frontal hair loss. Frontal and Temporal involvement was evident in 30% (24 out of 80) of cases. Only Temporal involvement was found in 26.25% of cases(21 out of 80). Study done by **Gan DC et al. [24]** reported findings where 752 women showed that central hair loss with a breach of the frontal hairline was the most prevalent (60%), followed by central hair loss without a breach of the frontal hairline (40%)**. Birch et al. [25]** found that 64.4% of women over 20 years of age exhibited bitemporal hair loss.

Similarly, **Sinclair et al. [26]** noted an increasing prevalence of mid-frontal hair loss with age, affecting 57% of women.

As individuals age, hair follicles undergo senescence and become more susceptible to the effects of androgens. This aging process contributes to the progression from Grade I to Grades II and III of FPHL observed in studies **[27].** The Environmental factors such as stress and diet which can influence hormonal balance and contribute to the progression of FPHL. Research also have shown correlations between stress levels and severity of hair loss, impacting the distribution of Ludwig grades[**28**].

Trichoscopic findings in patients of PCOS with FPHL:

1. Hair Miniaturization

Hair miniaturization refers to the progressive thinning and shrinking of hair follicles over time, leading to the production of finer and shorter hair strands. In Female Pattern Hair Loss (FPHL), hair miniaturization is a hallmark characteristic where terminal (thick, fully pigmented) hairs transform into vellus (fine, unpigmented) hairs due to the influence of androgens and genetic predisposition**[29,30].** It emerged as the most prevalent characteristic, observed in 97.5%(n=78) of cases.

2. Hair Shaft Diameter Diversity:

In Female Pattern Hair Loss (FPHL), hair shaft diameter diversity refers to the variation in thickness of hair strands observed in affected individuals. This diversity is a result of hair follicle miniaturization**[30]**. The statistical analysis of our study denotes a hair shaft diameter diversity to be 100% in all the patients (n=80). This signifies the close relationship in between hair miniaturization and hair shaft diameter diversity. Hair shaft diameter diversity must be >20% for the confirmation of the diagnosis of FPHL**[29]**.

3. Single Hair Follicular Units:

Single hair follicular unit refers to a dermoscopic finding where each hair follicle contains only a single hair. Normally, hair follicles can contain multiple hairs (2- 4 hairs per follicular unit), but in FPHL, there is a characteristic shift towards follicles producing only a single hair strand**[30]**. Single hair containing follicular units were noted in 53.75%(n=43) of patients.

4. Vellus Hair :
Vellus Hairs are fine, short, unpigmented or lightly pigmented hairs that are typically less than 2 mm in length. They are commonly found on areas of the body where terminal hair (thicker, fully pigmented hair) is absent or sparse, such as the face, back, and abdomen. Vellus hair was found out to be at 67.5%(n=54) which was significant and symbolized hair miniaturization and supports the findings of hair miniaturization in our study **[30]**.

5. Peripilar sign
The peripilar sign typically appears as a dark ring or halo around the hair follicle, often pigmented and contrasting with the surrounding scalp. It is associated with perifollicular fibrosis, which is a histopathological feature seen in FPHL. Perifollicular fibrosis involves the deposition of collagen around the hair follicle, contributing to its miniaturization and eventual loss of hair density**[30]**. It was observed less frequently, presenting in 17.5%(n=14) of cases.

6- Yellow Dots
Yellow dots in Female Pattern Hair Loss (FPHL) refer to small, round or oval, yellowish discolorations seen on dermoscopic examination of the scalp. These dots represent dilated orifices of sebaceous glands that are surrounded by a halo of yellowish discoloration. They are typically observed in areas where hair follicle miniaturization is occurring due to androgenetic alopecia**[30]**.Yellow dots were noted only in 22.5%(n=18).

Study conducted by **Rakowska A et al. [30]** states that the highest mean percentage of single-hair pilosebaceous units was found to be (65.2 ± 19.9%)(n=59). The highest yellow dots found was documented to be at(8.86% +-4.8)(n=59). The percentage of hair follicles with surrounding peri follicular discolouration was found out to be at 32.4+-4.7%(n=59).

In contrast**, Inui et al. [31]** investigated dermoscopic features among Asian individuals with female androgenetic alopecia (FAGA), highlighting hair diameter diversity (HDD) (>20%) in 100% cases, indicative of hair follicle miniaturization which was found out to be consistent with our study. Peripilar signs were observed in 20% of women with FAGA which was close with findings in our study . This outcome can be attributed to the different hormonal profiles operating in females in comparision to males.Yellow dots were present in 26% of AGA cases and 10% of FAGA cases, suggesting potential androgen-related sebaceous gland enlargement. The findings of yellow dots corroborates with our study.

Similarly, **Saquib et al. [32]** explored trichoscopic features in women with FPHL, noting diverse hair diameters (>20%) in 100% cases(n=115), single-hair follicular units 100%(n=115), vellus hair 98.3%(n=113), peripilar signs 88.7%(n=102), yellow dots 28.7%(n=33) in cases of female pattern hair loss (FPHL).

Differences in trichoscopic findings can arise due to variations in the study population's demographic characteristics, including ethnicity. For instance, studies by **Inui et al. [31]** and **Saquib et al. [32]** focused on Asian populations, which may exhibit distinct genetic predispositions and hair characteristics compared to other ethnic groups, potentially influencing the prevalence of trichoscopic features like hair diameter diversity and yellow dots.

John et al. [33] reported similar findings with hair diameter diversity of (>20%) in 100% of the patients and miniaturized hair being common dermoscopic observations across all patients. Maximum number of single follicular units was seen in frontal area at 48%(n=144), vellus hair at 67%(n=200)and yellow dots in 8.4%(n=20) of cases. Hair miniaturization can manifest as both increased hair diameter diversity and vellus hair .

Ramos et al. [61] highlighted hair follicle miniaturization in 100% cases(n=34), followed by brown peripilar halo in 64.70% (n=22) cases, and yellow dots in 2.94% (n=1) patient stressing on the varied dermoscopic features observed in studies examining FPHL.

Some other factors that contribute to the difference in data can be attributed to the fact that studies conducted in different geographical regions may encounter diverse environmental exposures and lifestyle factors that influence hair follicle health and presentation of trichoscopic patterns.

CONCLUSION-
The age distribution analysis highlights a concentrated prevalence of PCOS and FPHL among younger women, aligning with the typical onset ages of these conditions. The association between PCOS severity, as indicated by Polycystic Ovarian Morphology (PCOM) on ultrasound, and the presence of FPHL suggests a synergistic impact of hormonal imbalances, particularly androgen excess, on hair follicle health. Similarly, the high prevalence of hirsutism and acne in these patients underscores the systemic nature of androgenic manifestations in PCOS.

Trichoscopic findings, including hair miniaturization and diverse hair shaft diameters, provide valuable diagnostic markers for FPHL in PCOS patients, offering insights into disease progression and treatment efficacy. Differences in trichoscopic patterns across studies highlight potential ethnic and regional variations, influencing the presentation and interpretation of dermoscopic features.

Limitations Of The Study-
patients were included only from one hospital that represented a sample from a single geographical area.

Relevance Of The Study-
It will help to develop a better understanding about pcos and also understand its associated features along with its manifestations which will also in help future researchers.

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