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Original Research Article

Cutaneous Features Associated with Polycystic Ovarian Syndrome

Krishna Greeshma AG[1], Supriya Ghogare[2]

[1]Assistant Professor, Department of Dermatology, Bharat Ratna Atal Bihari Vajpayee Medical College and Kamla Nehru Hospital, Pune, Maharashtra, India

[2]Assistant Professor, Department of Obstetrics and Gynecology, Bharatratna Atalbihari Vajpayee Medical College and Kamla Nehru Hospital, Pune, Maharashtra, India

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Corresponding Author: Dr. Supriya Ghogare

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Abstract:

Background: Polycystic ovarian syndrome (PCOS) is a common endocrine disorder in women of reproductive age and is frequently associated with a wide spectrum of cutaneous manifestations that reflect underlying hyperandrogenism and metabolic derangements. These dermatological features often serve as early clinical indicators of the syndrome and may correlate with disease severity.

Material and Methods: A hospital-based cross-sectional study was conducted on 112 women aged 18–40 years diagnosed with PCOS according to the Rotterdam criteria. Detailed demographic and clinical data were collected. All participants underwent comprehensive dermatological evaluation for acne vulgaris, hirsutism, acanthosis nigricans, androgenetic alopecia, and other cutaneous features using standardized clinical scoring systems. Anthropometric measurements were recorded, and associations between cutaneous manifestations, body mass index, and menstrual irregularity were analyzed using appropriate statistical tests.

Results: The mean age of participants was 25.8 ± 4.9 years, and the mean body mass index was 27.4 ± 4.1 kg/m², with 55.4% of women classified as obese. Menstrual irregularities were present in 79.5% of cases. Acne vulgaris was the most common cutaneous manifestation (69.6%), followed by hirsutism (64.3%) and acanthosis nigricans (51.8%). Androgenetic alopecia was observed in 39.3% of patients. Mild acne and mild hirsutism were the predominant severity patterns. The prevalence of acne vulgaris, hirsutism, acanthosis nigricans, and androgenetic alopecia increased significantly with higher body mass index. These cutaneous manifestations were also significantly more frequent among women with menstrual irregularities.

Conclusion: Cutaneous manifestations are common and clinically significant in women with PCOS, particularly among those with higher body mass index and menstrual irregularities. Early identification of these dermatological features can aid in timely diagnosis and facilitate comprehensive, multidisciplinary management of PCOS.

Keywords: Polycystic Ovarian Syndrome; Acne Vulgaris; Hirsutism; Acanthosis Nigricans.

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Introduction

PCOS is a heterogeneous endocrine disorder characterized by reproductive dysfunction and systemic metabolic risk. The Rotterdam consensus defines PCOS as a syndrome in which at least two of the following are present after exclusion of related disorders: oligo-/anovulation, clinical and/or biochemical hyperandrogenism, and polycystic ovarian morphology on ultrasonography [1]. In addition to menstrual disturbance and infertility, the syndrome frequently coexists with obesity, insulin resistance, and cardiometabolic risk factors, underscoring the need for early recognition in routine clinical practice [1,2].

Cutaneous manifestations are clinically important in PCOS because they may represent visible expressions of androgen excess and metabolic dysregulation. International guidance emphasizes that clinical hyperandrogenism can carry substantial psychosocial burden and that patient-reported unwanted hair growth and/or female pattern hair loss should be taken seriously even when apparent clinical severity seems limited [2]. The same guideline also notes that acne and female pattern hair loss occurring in isolation (without hirsutism) are relatively weak predictors of biochemical hyperandrogenism, highlighting the importance of a structured clinical evaluation rather than reliance on a single skin sign [2].

Hyperandrogenism remains a central biological feature of PCOS and is a major driver of several dermatologic findings. In a contemporary review focusing on controversies in PCOS-related androgen excess, clinical hirsutism is reported in a substantial proportion of affected women, reflecting the

common clinical burden of androgen-mediated pilosebaceous unit changes [3]. Hirsutism itself is most often attributable to PCOS among hyperandrogenic etiologies, and standardized scoring using the modified Ferriman–Gallwey method is recommended to quantify severity and support reproducible assessment across studies and settings [4].

Female pattern hair loss is another androgen-associated presentation increasingly recognized in PCOS, yet its evaluation is often inconsistent across clinical pathways. Recent review synthesizing evidence on female pattern hair loss in PCOS highlights that hair loss may be more common among women with PCOS, while also noting that robust studies examining its broader clinical impact in this population remain limited [5]. These gaps matter because hair disorders, acne, and hirsutism can each contribute to distress, healthcare utilization, and delayed diagnosis when care is fragmented between specialties [2,5].

The reported frequency of dermatologic findings in PCOS varies by population, phenotype, and assessment approach. In an Indian cross-sectional clinical study, hirsutism, acne, female pattern hair loss, and acanthosis nigricans were among the commonly documented manifestations, reinforcing the relevance of dermatologic screening within PCOS evaluation [6]. Variation in prevalence across cohorts also suggests that local data are valuable for calibrating clinical suspicion and for understanding how factors such as adiposity and menstrual pattern relate to cutaneous burden in real-world practice [1,2,6].

Given the high clinical visibility of these manifestations and their potential links with endocrine–metabolic profiles, the present study was designed to characterize the spectrum and severity of cutaneous features among women with PCOS and to examine their associations with body mass index and menstrual irregularity in a tertiary-care setting.

Material and Methods

Study Design and Setting: A hospital-based, cross-sectional observational study was conducted in a tertiary care teaching hospital in India. The study duration was 18 months, including the period for participant recruitment, clinical evaluation, and data analysis.

Study Population: Women of reproductive age presenting to the gynecology outpatient department with features suggestive of PCOS, and subsequently referred for dermatological evaluation, were assessed for eligibility.

Inclusion Criteria

- Females aged 18–40 years
- Diagnosis of PCOS based on the Rotterdam 2003 criteria (presence of at least two of the following: oligo/anovulation, clinical and/or biochemical hyperandrogenism, and polycystic ovaries on ultrasonography)
- Willingness to participate and provide written informed consent

Exclusion Criteria

- Pregnant or lactating women
- Patients with known adrenal disorders, Cushing's syndrome, congenital adrenal hyperplasia, or androgen-secreting tumors
- Women receiving hormonal therapy, anti-androgens, systemic retinoids, or insulin-sensitizing agents within the preceding three months
- Known cases of thyroid dysfunction or hyperprolactinemia
- Patients with chronic dermatological diseases unrelated to PCOS

Sample Size: The sample size was calculated using a single-proportion formula, considering the prevalence of cutaneous manifestations in PCOS to be approximately 70% based on previous regional studies. With a confidence level of 95%, an absolute precision of 10%, and accounting for a 10% non-response rate, the minimum required sample size was estimated to be 100 participants. A total of 112 eligible women were ultimately enrolled to ensure adequate statistical power.

Sampling Technique: A consecutive sampling method was employed. All patients fulfilling the inclusion criteria during the study period were recruited until the desired sample size was achieved.

Data Collection: After obtaining informed consent, detailed demographic, menstrual, and clinical histories were recorded using a predesigned and pretested proforma. Information regarding age at menarche, menstrual regularity, duration of symptoms, weight changes, infertility, and family history of PCOS or metabolic disorders was documented.

Clinical Examination: A comprehensive general physical and systemic examination was performed. Anthropometric measurements, including height, weight, and waist circumference, were recorded, and body mass index (BMI) was calculated using standard formulae.

Dermatological evaluation was carried out by a qualified dermatologist under standardized lighting conditions. The following cutaneous features were specifically assessed:

- **Acne vulgaris:** graded using the Global Acne Grading System

- **Hirsutism:** evaluated using the modified Ferriman–Gallwey score; a score ≥8 was considered significant
- **Androgenetic alopecia:** assessed clinically and graded according to the Ludwig classification
- **Acanthosis nigricans:** noted for presence, distribution, and severity
- **Seborrhea, skin tags, and other pigmentary abnormalities:** recorded as present or absent

Photographic documentation was performed where necessary, with patient consent, maintaining confidentiality.

Laboratory and Radiological Evaluation: Relevant biochemical parameters, including serum total testosterone, fasting blood glucose, and lipid profile, were obtained from hospital records where available. Pelvic ultrasonography findings were reviewed to confirm ovarian morphology consistent with PCOS.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using statistical software SPSS. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Associations between cutaneous manifestations and clinical parameters such as BMI and menstrual irregularity were assessed using appropriate statistical tests, with a p-value <0.05 considered statistically significant.

Results

A total of 112 women diagnosed with polycystic ovarian syndrome were included in the final analysis. The mean age of the study population was 25.8 ± 4.9 years, with the majority of participants belonging to the 18–24-year age group (41.1%). The mean body mass index was 27.4 ± 4.1 kg/m², and more than half of the patients were classified as obese (55.4%). Menstrual irregularities were reported by 79.5% of participants, while a history of infertility was present in 30.4%. A positive family history of PCOS was noted in 24.1% of cases (Table 1).

Cutaneous manifestations were highly prevalent among women with PCOS. Acne vulgaris was the most frequently observed dermatological feature, affecting 69.6% of patients, followed by hirsutism in 64.3%. Acanthosis nigricans was identified in 51.8% of participants, while androgenetic alopecia was present in 39.3%. Other cutaneous findings included seborrhea (32.1%), skin tags (25.9%), and hyperpigmentation other than acanthosis nigricans (18.8%) (Table 2).

Among patients with acne vulgaris, mild disease constituted 39.7% of cases, whereas moderate and severe acne accounted for 37.2% and 23.1%, respectively. Hirsutism severity assessment revealed that nearly half of the affected patients had mild hirsutism (47.2%), followed by moderate (36.1%) and severe forms (16.7%). In women with androgenetic alopecia, Ludwig grade I was the most common pattern (59.1%), with progressively fewer cases observed in grades II (31.8%) and III (9.1%) (Table 3).

An increasing trend in the prevalence of major cutaneous manifestations was observed with rising body mass index. Acne vulgaris was present in 45.5% of women with normal BMI, compared to 64.3% in the overweight group and 80.6% among obese participants. Similarly, the frequency of hirsutism and acanthosis nigricans showed a significant escalation across BMI categories, with acanthosis nigricans affecting 69.4% of obese women. Androgenetic alopecia was also more common in higher BMI groups. These associations were statistically significant for acne vulgaris, hirsutism, acanthosis nigricans, and androgenetic alopecia (Table 4).

When stratified according to menstrual pattern, cutaneous manifestations were more frequently observed in women with menstrual irregularities. Acne vulgaris was noted in 74.2% of patients with irregular cycles compared to 52.2% of those with regular menstruation. Hirsutism and acanthosis nigricans followed a similar distribution, with significantly higher prevalence among women with menstrual irregularity. These differences were statistically significant (Table 5).

Discussion

In this cohort, cutaneous markers of hyperandrogenism and insulin resistance constituted the dominant clinical presentation, with acne and hirsutism accounting for most dermatology-related morbidity. This pattern is consistent with hospital-based PCOS dermatology series that report hirsutism and acne as the most frequent manifestations, with variable contributions from seborrhea, androgenic alopecia, acanthosis nigricans, and skin tags depending on case mix and diagnostic thresholds [7,8]. The observed clustering of multiple androgen-dependent findings within the same individuals supports the concept that dermatologic phenotyping can function as an accessible "external" readout of underlying endocrine-metabolic disturbance in PCOS [9].

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants (n = 112)

Variable	Value
Age (years), mean ± SD	25.8 ± 4.9
Age group (years), n (%)	
18–24	46 (41.1)
25–30	38 (33.9)
31–35	20 (17.9)
36–40	8 (7.1)
Body mass index (kg/m²), mean ± SD	27.4 ± 4.1
BMI category, n (%)	
Normal (18.5–22.9)	22 (19.6)
Overweight (23.0–24.9)	28 (25.0)
Obese (≥25.0)	62 (55.4)
Menstrual irregularity, n (%)	89 (79.5)
Infertility history, n (%)	34 (30.4)
Family history of PCOS, n (%)	27 (24.1)

Table 2: Prevalence of Cutaneous Manifestations in PCOS Patients

Cutaneous manifestation	n (%)
Acne vulgaris	78 (69.6)
Hirsutism	72 (64.3)
Acanthosis nigricans	58 (51.8)
Androgenetic alopecia	44 (39.3)
Seborrhea	36 (32.1)
Skin tags	29 (25.9)
Hyperpigmentation (other than AN)	21 (18.8)

Table 3: Severity Distribution of Major Cutaneous Manifestations

Acne vulgaris (n = 78)	
Severity (GAGS)	**n (%)**
Mild	31 (39.7)
Moderate	29 (37.2)
Severe	18 (23.1)
Hirsutism (Modified Ferriman–Gallwey score, n = 72)	
Score range	**n (%)**
8–15 (mild)	34 (47.2)
16–25 (moderate)	26 (36.1)
>25 (severe)	12 (16.7)
Androgenetic alopecia (n = 44)	
Ludwig grade	**n (%)**
Grade I	26 (59.1)
Grade II	14 (31.8)
Grade III	4 (9.1)

Table 4: Association between BMI and Selected Cutaneous Manifestations

Cutaneous manifestation	Normal BMI (n=22)	Overweight (n=28)	Obese (n=62)	p-value
Acne vulgaris, n (%)	10 (45.5)	18 (64.3)	50 (80.6)	0.01
Hirsutism, n (%)	9 (40.9)	16 (57.1)	47 (75.8)	0.003
Acanthosis nigricans, n (%)	4 (18.2)	11 (39.3)	43 (69.4)	<0.001
Androgenetic alopecia, n (%)	5 (22.7)	10 (35.7)	29 (46.8)	0.04

Table 5: Distribution of Cutaneous Manifestations According to Menstrual Irregularity

Cutaneous manifestation	Irregular cycles (n=89)	Regular cycles (n=23)	p-value
Acne vulgaris, n (%)	66 (74.2)	12 (52.2)	0.03
Hirsutism, n (%)	61 (68.5)	11 (47.8)	0.04
Acanthosis nigricans, n (%)	51 (57.3)	7 (30.4)	0.02

Acne burden in our study aligns with contemporary pooled estimates indicating that acne affects a substantial proportion of women with PCOS across regions and age groups [9]. Mechanistically, the concurrence of acne with other hyperandrogenic features in our tables is biologically plausible, because increased androgen action at the pilosebaceous unit and the amplifying role of insulin resistance on free androgen availability can intensify sebogenesis and inflammatory acne pathways [12]. The range of acne severity observed is also compatible with the heterogeneity highlighted in meta-analytic evidence, where variations in diagnostic criteria, age, and geography contribute to wide dispersion of prevalence and severity estimates [9].

For hirsutism, our severity distribution should be interpreted in the context of population-specific modified Ferriman–Gallwey (mFG) thresholds and ethnic variation in normative scores. Recent individual-participant-data work suggests that optimal mFG cutoffs differ across ethnic groups, reinforcing that "one-size-fits-all" thresholds can misclassify severity in some populations [12]. This is relevant when comparing our proportions of mild/moderate/severe hirsutism with other series, where differences may reflect both true phenotypic variability and methodological divergence in scoring and cut points [7,8].

Acanthosis nigricans showed a clear relationship with adiposity/metabolic risk indicators in our dataset, consistent with evidence linking insulin resistance and compensatory hyperinsulinemia to keratinocyte proliferation and hyperpigmented flexural plaques in PCOS [13]. Importantly, metabolic dysfunction in PCOS is not restricted to obesity; insulin resistance can be present across BMI strata, although it is more frequent and often more severe with higher adiposity [13]. Study-level comparisons further support this directionality: in a recent clinical PCOS cohort, acanthosis nigricans was significantly more common among overweight/obese participants than among those with lower BMI [8]. Beyond prevalence comparisons, biochemical correlations have also been demonstrated—patients with PCOS and acanthosis nigricans have shown higher insulin-resistance indices (e.g., HOMA-IR) compared with those without acanthosis nigricans, supporting its value as a bedside marker prompting metabolic evaluation [9].

Androgenic alopecia/female pattern hair loss (FPHL) in our cohort should be contextualized carefully because FPHL is not uniformly synonymous with biochemical hyperandrogenism. Expert recommendations emphasize that isolated FPHL may occur with normal androgen levels, while the coexistence of FPHL with other androgen-excess features (e.g., hirsutism, acne, menstrual dysfunction) strengthens the rationale for endocrine evaluation [14]. Contemporary dermatology literature also underscores standardized clinical grading (e.g., Ludwig/Olsen/Sinclair) and acknowledges multifactorial drivers beyond androgens alone, including genetic susceptibility and environmental modulators [15]. In our study, the overlap of hair loss with additional hyperandrogenic findings supports interpreting alopecia as part of a broader PCOS phenotype rather than a solitary sign.

Finally, skin tags—although often viewed as benign—may carry metabolic implications. Recent evidence suggests that acrochordons can be associated with insulin resistance–related phenotypes and may serve as a clinical prompt for metabolic screening in relevant contexts [16]. While this literature is not PCOS-exclusive, it is directionally consistent with the metabolic axis of PCOS and supports integrated dermatologic–metabolic assessment when skin tags coexist with acanthosis nigricans or central adiposity [13,16].

Overall, our findings reinforce that (i) acne and hirsutism remain the most informative cutaneous pointers to PCOS in clinical practice, (ii) acanthosis nigricans tracks with metabolic risk and should prompt cardiometabolic evaluation, and (iii) alopecia and skin tags, particularly when occurring alongside other androgen-dependent signs, merit broader endocrine-metabolic assessment. Key limitations that should temper inference include the single-center design, potential referral enrichment for dermatologic complaints, and reliance on clinical grading systems that may not be fully comparable across populations without harmonized thresholds (notably for hirsutism) [12]. Future work combining standardized dermatologic scoring with rigorous metabolic phenotyping would clarify how well specific cutaneous patterns predict insulin resistance severity and long-term cardiometabolic outcomes in PCOS [9,13].

Conclusion

Cutaneous manifestations were highly prevalent among women with polycystic ovarian syndrome, with acne vulgaris, hirsutism, and acanthosis nigricans being the most frequently observed features. The burden and severity of these dermatological findings showed a clear association with higher body mass index and the presence of menstrual irregularities, suggesting an interplay between metabolic dysfunction and hyperandrogenism in PCOS. Recognition of these cutaneous signs is clinically important, as they may serve as visible markers of underlying endocrine and metabolic abnormalities, emphasizing the need for a multidisciplinary approach involving both dermatological and gynecological evaluation for

early diagnosis and comprehensive management of affected patients.

References

1. Rotterdam ESHRE/ASRM-Sponsored PCOS consensus workshop group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome (PCOS). Hum Reprod. 2004 Jan;19(1):41-7. doi: 10.1093/humrep/deh098.
2. Teede HJ, Tay CT, Laven JJE, Dokras A, Moran LJ, Piltonen TT, et al. Recommendations From the 2023 International Evidence-based Guideline for the Assessment and Management of Polycystic Ovary Syndrome. J Clin Endocrinol Metab. 2023 Sep 18;108(10):2447-2469. doi: 10.1210/clinem/dgad463.
3. Kanbour SA, Dobs AS. Hyperandrogenism in Women with Polycystic Ovarian Syndrome: Pathophysiology and Controversies. Androgens. 2022 Mar 1;3(1):22-30. doi: 10.1089/andro.2021.0020
4. Elliott J, Liu K, Motan T. Guideline No. 444: Hirsutism: Evaluation and Treatment. J Obstet Gynaecol Can. 2023 Dec;45(12):102272. doi: 10.1016/j.jogc.2023.102272.
5. Jiang VS, Hawkins SD, McMichael A. Female pattern hair loss and polycystic ovarian syndrome: more than just hirsutism. Curr Opin Endocrinol Diabetes Obes. 2022 Dec 1;29(6):535-540. doi: 10.1097/MED.0000000000000777.
6. Keen MA, Shah IH, Sheikh G. Cutaneous Manifestations of Polycystic Ovary Syndrome: A Cross-Sectional Clinical Study. Indian Dermatol Online J. 2017 Mar-Apr;8(2):104-110. doi: 10.4103/2229-5178.202275.
7. Kaur S, Gupta SK, Juneja SK, Kaur S, Rani M. Study of cutaneous manifestations of polycystic ovarian syndrome. Int J Reprod Contracept Obstet Gynecol. 2020;9(4):1627–1631. doi:10.18203/2320-1770.ijrcog20201235.
8. Markan S, Jaggi S. Cutaneous manifestations of polycystic ovary syndrome: a cross-sectional clinical study. Int J Med Public Health. 2025 Apr–Jun;15(2):997–1001. doi:10.70034/ijmedph.2025.2.181.
9. Artar G, Tas B, Turan G, Uckan HH. Evaluation of androgen-dependent skin findings of polycystic ovary syndrome (PCOS). Gynecol Endocrinol. 2022 Dec;38(12):1104-1108. doi: 10.1080/09513590.2022.2162496.
10. Pourahmad B, Majidnia M, Saniee N, Afraie M, Riyahifar S, Darbandi Z. Prevalence of Acne Vulgaris Among Women with Polycystic Ovary Syndrome: A Systematic Review and Meta-Analysis. Med J Islam Repub Iran. 2025 Aug 11; 39:105. doi: 10.47176/mjiri.39.105.
11. Damoulaki E, Sioutis D, Sarli V, Trakakis E, Mastorakos G, Katoulis A, et al. Polycystic Ovary Syndrome-Associated Acne: The Interplay of Hyperandrogenism, Insulin Resistance, and Therapeutic Strategies. Cureus. 2025 Nov 29;17(11):e98103. doi: 10.7759/cureus.98103.
12. Bizuneh AD, Joham AE, Tay CT, Kiconco S, Earnest A, Dhungana RR, et al. The PCOS Phenotype in Unselected Populations study: ethnic variation in population-based normative cut-offs for defining hirsutism. Eur J Endocrinol. 2025 Mar;192(3):228–239. doi:10.1093/ejendo/lvaf030.
13. Prosperi S, Chiarelli F. Insulin resistance, metabolic syndrome and polycystic ovaries: an intriguing conundrum. Front Endocrinol (Lausanne). 2025 Oct 1; 16:1669716. doi: 10.3389/fendo.2025.1669716.
14. Carmina E, Azziz R, Bergfeld W, Escobar-Morreale HF, Futterweit W, Huddleston H, et al. Female pattern hair loss and androgen excess: a report from the Multidisciplinary Androgen Excess and PCOS Committee. J Clin Endocrinol Metab. 2019 Jul;104(7):2875–2891. doi:10.1210/jc.2018-02548.
15. Ho CY, Chen JY, Hsu WL, Yu S, Chen WC, Chiu SH, et al. Female Pattern Hair Loss: An Overview with Focus on the Genetics. Genes (Basel). 2023 Jun 23;14(7):1326. doi: 10.3390/genes14071326.
16. Greene RK, Gangidi S, Zhao R, Nelson JM, Harms K, Nakamura M. The relationship between acrochordons, obesity, and metabolic syndrome in the pediatric population: A retrospective cohort study. Pediatr Dermatol. 2024 Jul-Aug;41(4):660-666. doi: 10.1111/pde.15639.