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Dermatological burden in polycystic ovary syndrome: Correlation of cutaneous manifestations with hormonal profile and quality of life in a hospital based cohort

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Abstract

Background: Polycystic Ovary Syndrome (PCOS) is a multifactorial endocrine disorder affecting reproductive-aged women and is frequently associated with dermatological manifestations. These cutaneous features not only serve as visible markers of the underlying hormonal imbalance but also contribute significantly to psychosocial distress. Assessment of quality of life (QoL) in such individuals, especially using validated tools like the WHOQOL-BREF, provides critical insight into the broader impact of PCOS.

Objective: To evaluate the prevalence and spectrum of cutaneous manifestations in patients with PCOS and assess their impact on quality of life using the WHOQOL-BREF instrument.

Methods: A hospital-based observational cross-sectional study was conducted over 18 months among 130 women aged 18-40 years attending the Dermatology OPD at Akash Institute of Medical Sciences and Research Centre. All patients presented with at least one cutaneous manifestation suggestive of PCOS and were confirmed by clinical examination and ultrasonography. Hormonal assays including serum testosterone, prolactin, LH, FSH, LH/FSH ratio, and DHEAS were performed. WHOQOL-BREF was used to assess quality of life across physical, psychological, social, and environmental domains.

Results: The most prevalent cutaneous features were hirsutism (77.7%), seborrhea (48.5%), acne (47.4%), and acanthosis nigricans (43.1%). Female pattern hair loss (40%), striae (19.2%), and acrochordons (15.4%) were also reported. Quality of life was significantly impaired in all domains, especially in patients with hirsutism and acne (social domain) and acanthosis nigricans (physical domain). Statistical significance was noted between dermatological manifestations and QoL impact ($p < 0.05$).

Conclusion: Cutaneous manifestations in PCOS are frequent and have a profound negative impact on quality of life. Hirsutism, acne, and acanthosis nigricans are not only clinical indicators but also contribute significantly to psychological and social burden. Early identification and multidisciplinary management addressing both physiological and psychosocial aspects are crucial for holistic care in PCOS.

Keywords: Polycystic ovarian syndrome, hirsutism, acne, androgenetic alopecia, quality of life, hyperandrogenism, endocrine disorder

Introduction

Polycystic Ovary Syndrome (PCOS) is a prevalent endocrine disorder that affects a significant proportion of women of reproductive age globally. It is characterized by a triad of clinical features—hyperandrogenism, chronic anovulation, and polycystic ovarian morphology^[1,2]. Between 1990 and 2019, the global burden of PCOS increased by approximately 54%, with the highest prevalence observed in adolescents aged 15-19 years, followed by the 10-14-year age group^[3].

PCOS is frequently associated with a wide range of cutaneous manifestations, which often serve as early indicators of the underlying hormonal dysfunction. These dermatological signs are critical in the diagnosis and management of PCOS, as they contribute not only to physical discomfort but also to significant psychosocial morbidity^[1,2]. The cutaneous manifestations

result primarily from elevated androgen levels and include acne, hirsutism, and androgenetic alopecia^[1,2].

Acne is among the most common dermatological complaints in PCOS, affecting nearly 50-70% of patients. It commonly involves sebaceous gland-rich areas such as the face, back, and chest, manifesting as comedones, papules, pustules, and nodules^[1,2].

Hirsutism, defined as excessive terminal hair growth in a male-pattern distribution (e.g., upper lip, chin, chest, and abdomen), is driven by elevated androgen levels, especially testosterone. The Ferriman-Gallwey scoring system remains a validated tool to assess its severity^[4].

Androgenetic alopecia, or female-pattern hair loss, manifests as diffuse scalp thinning. It is hypothesized that high androgen levels disrupt the hair follicle cycle, leading to miniaturization of hair shafts and reduced hair density^[5].

Acanthosis nigricans presents as hyperpigmented, velvety plaques typically located on the neck, axillae, and groin. It is commonly associated with insulin resistance, a metabolic abnormality frequently seen in PCOS patients^[6].

Women with PCOS and cutaneous symptoms are often subject to profound psychological distress. Concerns over physical appearance can lead to low self-esteem, anxiety, and social withdrawal^[7,8]. Studies have consistently shown that patients with visible dermatologic features of PCOS report significantly lower quality of life scores compared to those without these manifestations^[7,8].

Given this background, the current study aims to systematically evaluate the cutaneous manifestations of PCOS and examine their correlation with quality of life, as assessed using the WHOQOL-BREF tool.

Objectives of The Study

- To evaluate the correlation between cutaneous manifestations of Polycystic Ovary Syndrome (PCOS) and associated biochemical and ultrasonographic parameters.
- To assess the impact of various dermatological features of PCOS on the quality of life of affected women, using the WHOQOL-BREF instrument.

Materials and Methods

Study Design

This was a hospital-based observational cross-sectional study conducted at the Department of Dermatology, Akash Institute of Medical Sciences and Research Centre, Bengaluru, Karnataka. The study was carried out over a period of 18 months, from August 2022 to January 2024.

Study Population

A total of 130 female patients, aged between 18 and 40 years, presenting to the Dermatology outpatient department with cutaneous features suggestive of PCOS—such as acne, hirsutism, and acanthosis nigricans—were enrolled. Diagnosis of PCOS was confirmed based on clinical features and ultrasonographic evidence of polycystic ovarian morphology.

Inclusion Criteria

- Female patients aged 18-40 years
- Presence of at least one cutaneous manifestation of PCOS
- Confirmation of PCOS diagnosis through ultrasonography

- Willingness to provide written informed consent

Exclusion Criteria

- Pregnant women
- Patients with known endocrinopathies including hypothyroidism, Cushing's syndrome, congenital adrenal hyperplasia, or adrenal tumors
- Patients unwilling to participate or provide consent

Clinical Assessment

A detailed dermatological examination was conducted to document the presence and severity of cutaneous manifestations including acne vulgaris, hirsutism (scored using the Ferriman-Gallwey system), androgenetic alopecia, seborrhea, striae, acrochordons, and acanthosis nigricans.

Investigations

All participants underwent transabdominal or transvaginal pelvic ultrasonography to assess ovarian morphology. Blood samples (5 mL) were collected under aseptic precautions and analyzed for the following hormonal parameters:

- Serum Prolactin
- Serum Total Testosterone
- Follicle Stimulating Hormone (FSH)
- Luteinizing Hormone (LH)
- LH/FSH Ratio
- Dehydroepiandrosterone Sulfate (DHEAS)

Quality of Life Assessment

The WHOQOL-BREF questionnaire was administered to all participants to assess quality of life across four domains:

- Physical health
- Psychological well-being
- Social relationships
- Environmental factors

Statistical Analysis

All collected data were tabulated using Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics including mean, standard deviation, frequency, and percentage were used to summarize demographic and clinical characteristics. Comparative analyses were performed using the Chi-square test. A p-value of <0.05 was considered statistically significant.

Results

The mean age of the study participants diagnosed with PCOS was 29.95 ± 3.75 years, with the majority (42.3%) belonging to the 31-35 years age group. (Table 1) The mean BMI was 27.78 ± 4.04 kg/m², and 42.3% of participants were in the 25-29.9 kg/m² BMI category. (Figure 1) The mean waist-to-hip ratio was 1.0062 ± 0.24 , with a range of 0.82 to 1.93.

Table 1: Age group

Age group	Frequency	Percent
21-25 years	18	13.8
26-30 years	50	38.5
31-35 years	55	42.3
36-40 years	7	5.4
Total	130	100.0
MEAN $\pm$ SD	29.95 $\pm$ 3.752	

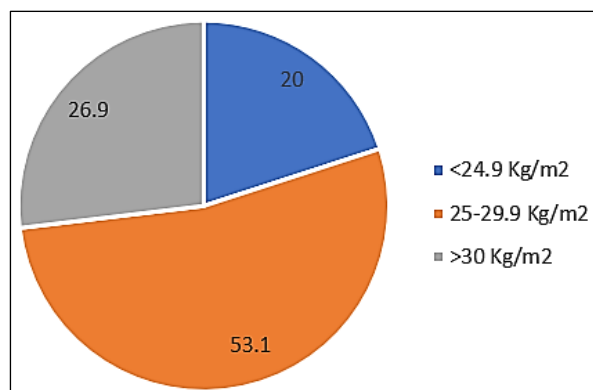


Fig 1: BMI

The mean levels of FSH and LH were 4.31 ± 1.95 IU/L and 7.83 ± 3.61 IU/L, respectively. Serum prolactin, testosterone, and DHEAS levels averaged 14.16 ± 7.32 ng/mL, 55.34 ± 17.22 ng/dL, and 132.81 ± 43.23 µg/dL, respectively. The mean LH/FSH ratio was 2.11 ± 1.26 . (Table 2)

Table 2: Laboratory parameters

Laboratory parameters	Minimum	Maximum	Mean	S. D
FSH (IU/L)	2.38	10.09	4.3086	1.95564
LH (IU/L)	1.90	18.90	7.8261	3.60539
Prolactin (IU/L)	2.80	29.10	14.1611	7.31552
Testosterone (ng/dl)	14	78	55.34	17.217
DHEAS (µg/dl)	14.50	210.40	132.8115	43.23030
L/H ratio	0.23	6.90	2.1124	1.26109

Among the study population, 77.7% exhibited hirsutism, 48.5% presented with seborrhea, 47.4% had acne, and 43.1% showed signs of acanthosis nigricans. Additionally, 40% had female pattern hair loss (FPHL), 19.2% exhibited striae, and 15.4% had acrochordons. (Table 3)

Table 3: Distribution of Cutaneous manifestations

Cutaneous manifestations	Frequency	Percent
Hirsutism	101	77.7
Acrochordons	20	15.4
Acne	62	47.7
Female Pattern Hair Loss	52	40.0
Acanthosis Nigricans	56	43.1
Seborrhea	63	48.5
Striae	25	19.2

Quality of life (QoL) assessments revealed that subjects with hirsutism, acne, and FPHL experienced the greatest impact in the social domain, compared to the physical, psychological, and environmental domains. In patients with acanthosis nigricans, the physical domain was most affected, while striae predominantly impacted the psychological domain. For those with acrochordons, the environmental domain showed the highest impairment. (Table 4)

Table 4: Quality of Life Score in Patients With PCOS

Quality of Life	Mean	Std. Deviation
Physical domain	13.69	5.265
Psychological domain	11.73	5.722
Social domain	13.61	4.690
Environment domain	13.72	4.834
Total scores	52.75	10.287

Discussion

Polycystic Ovary Syndrome (PCOS) is a complex endocrine disorder predominantly affecting women of reproductive age. Among the spectrum of its clinical features, dermatological manifestations are particularly prominent and have a substantial impact on patients' quality of life. Our study aimed to evaluate these cutaneous signs in PCOS and their association with metabolic parameters and psychological well-being.

In our study, the mean age of participants was 29.95 ± 3.75 years, with the highest proportion (42.3%) between 31-35 years. Similar age profiles have been reported by Abusailik *et al.* [9] and Jain *et al.* [10], who documented mean ages of 26.3 years, while Keen *et al.* [12] reported 25.18 years. However, Mukkamala *et al.* [11] observed a lower mean age (22.4 ± 2.5 years), potentially attributable to regional and demographic differences. Lifestyle changes, including increased consumption of calorie-dense food and reduced physical activity, especially in younger age groups, may contribute to the rising incidence of PCOS.

The mean BMI in our population was 27.78 ± 4.04 kg/m², with 42.3% falling into the overweight category. While Abusailik *et al.* [9] and Kaur *et al.* [13] reported slightly lower average BMIs (25.9 ± 3.8 kg/m² and 23 kg/m², respectively), our findings may reflect increasing urbanization, dietary transitions, and sedentary lifestyles in the population studied. Ethnic and geographic variability likely also influence BMI distribution and associated metabolic risk.

Notably, the mean waist-to-hip ratio (WHR) in our study was 1.0062 ± 0.24 , ranging from 0.82 to 1.93. This ratio was slightly lower among individuals presenting with acanthosis nigricans, seborrhea, striae, and acrochordons. This supports the growing consensus that increased WHR is a reliable surrogate for insulin resistance and metabolic syndrome. Similar trends were observed in the study by Kaur *et al.*, where 33% of subjects had a WHR > 0.85, reinforcing the role of WHR as a clinical tool for assessing metabolic risk [13].

Hormonal profiling revealed a mean FSH of 4.31 ± 1.95 IU/L and LH of 7.83 ± 3.61 IU/L. Serum prolactin, testosterone, and DHEAS were recorded at 14.16 ± 7.32 , 55.34 ± 17.22 , and 132.81 ± 43.23 respectively, with an LH/FSH ratio of 2.11 ± 1.26 . Jain *et al.* [10] reported slightly higher levels of FSH (5.05 ± 1.86) and LH (8.14 ± 5.21), as well as testosterone (61.01 ± 25.32), aligning with our findings. DHEAS levels remained comparable to our cohort. Mukkamala *et al.* [11] highlighted elevated fasting insulin and LH as the most common hormonal abnormalities, a finding that emphasizes the metabolic burden of PCOS.

Among dermatological signs, hirsutism (77.7%) was the most prevalent, followed by seborrhea (48.5%), acne (47.4%), acanthosis nigricans (43.1%), female pattern hair loss (FPHL, 40%), striae (19.2%), and acrochordons (15.4%). Keen *et al.* [12] corroborated our findings, with hirsutism reported in 78% of subjects. Other cutaneous features, such as acne and FPHL, were also comparable. Kaur *et al.* [13] similarly emphasized hirsutism as the most frequent dermatological marker. Conversely, Abusailik *et al.* [9] and Mukkamala *et al.* [11] identified acne and acanthosis nigricans as predominant, indicating regional and diagnostic variability.

Quality of Life (QoL), assessed using the WHOQOL-BREF tool, was markedly impaired among PCOS patients, particularly in those exhibiting cutaneous manifestations.

The average overall QoL score was 52.75 ± 10.29 . Domain-specific analysis revealed that the psychological domain had the lowest mean score (11.7), whereas the physical, social, and environmental domains were relatively higher (13.6–13.7). These findings echo the existing literature where visible dermatological changes in PCOS are associated with social embarrassment, reduced self-esteem, and heightened psychological distress^[7,8].

Hirsutism had the greatest impact on the social domain, supporting the conclusion of Schmidt *et al.*¹⁴, who noted that elevated free testosterone levels and corresponding cutaneous manifestations were significantly associated with impaired social functioning and mental health outcomes. Acne and acanthosis nigricans also exhibited a strong negative correlation with QoL, particularly affecting the physical and psychological domains.

Interestingly, while mean values of FSH, LH, prolactin, and DHEAS were higher in patients with dermatological symptoms such as acne, FPHL, and acanthosis nigricans, levels of testosterone and the LH/FSH ratio were paradoxically lower in these groups. This highlights the heterogeneity in hormonal expression among PCOS patients and the necessity for individualized assessment.

Our findings emphasize the significant psychosocial burden of dermatological manifestations in PCOS. These features are not merely cosmetic issues but markers of systemic metabolic dysfunction, reinforcing the importance of early dermatological evaluation in PCOS patients. However, limitations such as small sample size, lack of randomization, and absence of a multi-observer standardized evaluation may affect the generalizability of our findings.

Future studies with larger, multicentric cohorts using standardized evaluation tools are warranted to further delineate these associations and guide more comprehensive management strategies.

Conclusion

Polycystic Ovary Syndrome (PCOS) predominantly affects young women and is commonly accompanied by dermatological manifestations such as hirsutism, acne, acanthosis nigricans, female pattern hair loss, seborrhea, striae, and acrochordons. These features, although dermatological in nature, often serve as visible indicators of underlying hormonal imbalances, including elevated LH, testosterone, and LH/FSH ratios. Their presence significantly impacts psychosocial well-being, contributing to reduced self-esteem and quality of life.

The study highlights that dermatological signs can serve as early clinical markers of PCOS and should prompt comprehensive endocrine and metabolic evaluations. Quality of life was significantly lower in patients exhibiting cutaneous symptoms, particularly in the psychological and social domains.

Given the systemic implications and psychosocial consequences of PCOS-related skin conditions, a multidisciplinary approach—including dermatological, endocrinological, and psychological interventions—is essential for timely diagnosis, holistic management, and improved patient outcomes. Future research should focus on larger, multicentric cohorts with standardized diagnostic protocols to validate these findings and establish evidence-based clinical guidelines.

Limitations

- Single centre study.
- Limited sample size.

- No long-term follow-up.
- Use of WHOQOL over PCOS-specific QoL tools.

Conflict of Interest

None Declared

Source of support

Nil

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