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Exploring Skin Manifestations in Women with Polycystic Ovary Syndrome: A Cross-sectional Analysis.

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Abstract:
Polycystic ovary syndrome (PCOS) is a complex multisystem metabolic disorder that significantly affects fertility and overall quality of life. Cutaneous manifestations such as acne, hirsutism, androgenetic alopecia, acanthosis nigricans, and seborrhea are commonly observed in PCOS patients. This study aimed to identify the types, incidence, and frequency of dermatological manifestations associated with PCOS across different age groups. **Methods:** A prospective, institution-based study was conducted at the Department of Obstetrics and Gynecology and Department of Dermatology, Venereology & Leprosy, NC Medical College and Hospital, Panipat, Haryana, India. Eighty patients diagnosed with PCOS based on the Rotterdam criteria and meeting the inclusion criteria were enrolled and clinically examined for cutaneous signs. **Results:** The most affected age group was 21–30 years (53.8%). Acne vulgaris emerged as the most common cutaneous manifestation (56.3%). Obesity was present in 50% of patients, all of whom exhibited striae. Additionally, 16.2% of patients were classified as overweight. Hirsutism was noted in 47.5%, primarily with terminal hair growth on the chin and upper lip. Acanthosis nigricans was found in 38.6% of patients, seborrhea in 21.3%, and acrochordons in 18.8%. **Conclusions:** Cutaneous manifestations play a significant role in the clinical presentation and management of PCOS. Dermatologists are well-positioned to identify early signs of PCOS, particularly in women presenting with hyperandrogenic symptoms. Early recognition provides an important opportunity for initiating long-term management strategies for this multifaceted condition.

Keywords: Polycystic ovarian syndrome, Cutaneous manifestations

Introduction

Polycystic Ovary Syndrome (PCOS), also known as Stein–Leventhal syndrome, is a complex endocrine disorder with a wide range of clinical presentations and systemic implications. It is among the most common causes of chronic anovulation and hyperandrogenism in women of reproductive age, affecting approximately 5–20% of

this population, depending on the diagnostic criteria used—namely the National Institutes of Health (NIH), Rotterdam, or Androgen Excess and PCOS Society (AES) standards [1,2,4].

PCOS is characterized by reproductive, metabolic, and dermatological disturbances, making it a multisystem condition that significantly impacts fertility and quality of life [5]. The diagnostic triad includes hyperandrogenism, oligo- or anovulation, and polycystic ovarian morphology on ultrasound. Based on these criteria, PCOS is categorized into four phenotypes [6]: Hyperandrogenism, polycystic ovaries, and oligomenorrhea, Hyperandrogenism with oligomenorrhea, Oligomenorrhea with polycystic ovaries, Hyperandrogenism with polycystic ovaries.

Cutaneous manifestations are often the earliest clinical indicators of PCOS, frequently preceding the onset of metabolic or reproductive symptoms. These skin-related signs are primarily driven by elevated androgen levels and insulin resistance—two hallmark features of PCOS. Androgen excess stimulates sebaceous gland activity and hair follicle growth, resulting in dermatologic features such as acne, hirsutism, seborrhea, and androgenic alopecia [3].

Hirsutism, defined by the presence of excessive terminal hair in a male-pattern distribution, affects 70–80% of PCOS patients and is a key diagnostic clue [3]. Acne in PCOS is often persistent, inflammatory, and resistant to conventional treatments, particularly in adult women. Female-pattern hair loss, or androgenic alopecia, can be especially distressing due to its chronic course and poor response to therapy [10]. Insulin resistance, present in up to 50–70% of women with PCOS, contributes to dermatologic changes by affecting keratinocyte and melanocyte function [11]. This often results in the development of acanthosis nigricans—velvety hyperpigmented plaques typically found on the neck, axillae, and groin. Acrochordons (skin tags) are also commonly observed and may indicate underlying metabolic dysfunction [6,11].

Other associated dermatoses include striae, xanthomas, Demodex folliculorum infestation, pyoderma gangrenosum, and hidradenitis suppurativa (as part of the PASH syndrome) [7]. PCOS is also linked to syndromes such as SAHA (seborrhea, acne, hirsutism, alopecia), and, in rare cases, mucosal pigmentation as seen in Peutz-Jeghers syndrome has been reported [8,9]. Beyond the physical symptoms, the cutaneous manifestations of PCOS can lead to significant psychological distress. These visible changes often result in reduced self-esteem, social withdrawal, and increased rates of anxiety and depression, particularly in women with facial hirsutism or severe acne [12,13]. Therefore, a holistic and empathetic approach is essential for comprehensive PCOS management.

Given that dermatologists are often the first to encounter signs of PCOS, such as acne or hirsutism, they play a pivotal role in early diagnosis and referral for endocrinological evaluation [14]. Interdisciplinary collaboration between dermatologists, gynecologists, and endocrinologists is essential for effective management. Treatment strategies typically include a combination of hormonal therapies (such as oral contraceptives and anti-androgens), insulin sensitizers, topical agents, and procedural dermatological interventions like laser hair removal or chemical peels [15,16].

Despite the high prevalence and diagnostic relevance of cutaneous symptoms in PCOS, there is a paucity of regional data quantifying their incidence and distribution across age groups. The present study aims to fill this gap by assessing the prevalence and types of dermatological manifestations in patients with PCOS. This information can aid clinicians in early identification, diagnosis, and tailored treatment planning for women with PCOS.

Aims and Objectives

- Identify the most common cutaneous manifestations associated with PCOS.
- Determine the incidence of these manifestations among PCOS patients.
- Analyze their frequency across different age groups.

Materials and Methods

This descriptive cross-sectional study was conducted at NC Medical College and Hospital, Panipat, Haryana, India. A total of 80 female patients, aged between 15 and 40 years, diagnosed with PCOS based on the Rotterdam criteria (requiring two out of three features: oligo/anovulation, hyperandrogenism, and polycystic ovaries on ultrasound) and willing to participate in the study were included in the study.

Exclusion Criteria

- Patients with other endocrinopathies (e.g., congenital adrenal hyperplasia, Cushing's syndrome, thyroid disorders).
- Patients on hormonal therapy for any other condition.
- Pregnant or lactating women.
- Patients with known dermatologic disorders unrelated to PCOS.

Data Collection: To diagnose PCOS in our study, patient's pelvic ultrasonography was done, and a blood sample sent for random blood sugar (RBS) and hormonal assay for free testosterone, dehydroepiandrosterone (DHEAs), LH: FSH (leutinising hormone and follicle stimulating hormone) ratio and thyroid profile wherever necessary. After obtaining informed consent, demographic data, clinical history, and detailed dermatologic examination findings were recorded using a structured proforma. A thorough skin examination was performed by a dermatologist to identify cutaneous signs including hirsutism (scored using the modified Ferriman-Gallwey score), acne (graded by severity), androgenic alopecia (classified using Ludwig's scale), seborrhea, acanthosis nigricans, and skin tags.

Statistical Analysis: Data was entered and analyzed using SPSS-23. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as means ± standard deviations. The association between cutaneous findings and clinical parameters (e.g., BMI, duration of PCOS, menstrual irregularities) was analyzed using chi-square test or independent t-test, with a p-value <0.05 considered statistically significant.

Results

It is an institution based prospective observational study. A total of 80 PCOS females diagnosed based on the basis of Rotterdam criteria were included in the present study.

The mean age of the study participants was 29.3 ± 7.0 years (Range- 16 to 40 years). A majority of patients were in the age group of 20-30 years (53.8%). Nine patients (16%) had a positive family history of PCOS.

The mean BMI was 29.95 ± 6.5 kg/m². Menstrual irregularities were reported by 56.3% (45/80) of the participants, indicating a strong reproductive component in the cohort. Additionally, 48% of the women were married, while 33% were nulliparous at the time of the study. Demographic and baseline parameters have been detailed in **table 1**.

Table 1: Demographic and baseline characteristics of study participants.

Variable	**Value (n = 80)**
Age (years) (Mean±SD)	29.3±7.01
Range of age	16-40
Age group	
• 15-20	30 (37.4%)
• 20-30	43 (53.8%)
• 30-40	7 (8.8%)
BMI (Mean±SD)	29.95±6.5
BMI ≥ 25 kg/m²	40 (50%)
Menstrual irregularities	45(56.3%)
Married	32 (40%)
Nulliparous	33 (41.3%)

Cutaneous manifestations

Among the study patients, the most commonly observed cutaneous manifestation was acne vulgaris (56.3%), followed by striae (48.8%). **(Table 2)** Acne vulgaris was observed in 45 cases, of which 38 patients (84.4%) had grade II acne vulgaris which was the predominant type. Striae were seen in 39 patients (48.8%).

Table 2: Cutaneous manifestations among PCOS patients.

Cutaneous manifestation	**Number of cases**	**Percentage (%)**
Acne vulgaris	45	56.3
Striae	39	48.8
Hirsutism	38	47.5
Obesity	40	50
Acanthosis nigricans	31	38.6

Seborrhea	17	21.3
Acrochordons	15	18.8

All the obese patients were found to have striae and were predominantly distributed over the lower abdomen, outer aspect of thighs and buttocks. Hirsutism was reported in 38 patients (47.5%), of which majority of the patients had involvement over upper lip and chin. Forty patients (50%) were obese and, 13 patients (16.2%) were overweight. Acanthosis nigricans was recorded in 31 cases (38.6%), 17 patients (21.3%) were found to have seborrhea and 15 patients (18.8%) presented with acrochordons.

Table 3: BMI values among PCOS patients.

BMI value (kg/m2)	Number of cases	Percentage (%)
<18.5	2	2.5
18.5–22.9	25	31.3
23–24.9	13	16.2
>25	40	50

The study population had 45 unmarried females and 35 married females. Out of 45 unmarried women**,** majority of the unmarried women, 64.4% (29 patients) presented with oligomenorrhoea, 15.6% (7 patients) presented with amenorrhoea and 20% (9 patients) had normal menstrual cycles. Out of the 35 married women, 85.7% (30 patients) presented with oligomenorrhoea, 5.7% (2 patients) presented with amenorrhoea while 8.6% (3 patients) presented with menorrhagia. Spontaneous abortions were reported in 17.1% (6) of the patients and infertility among 60% (21) of the patients. **(Table 4)**

Table 4: Gynecological abnormalities in unmarried and married women.

Married women (n=35)		**Unmarried women** (n=45)	
Menstrual irregularities	**Number Of cases (%)**	**Menstrual irregularities**	**Number Of cases (%)**
Oligomenorrhoea	30 (85.7)	Oligomenorrhoea	29 (64.4)
Amenorrhoea	2 (5.7)	Amenorrhoea	7 (15.6)
Menorrhagia	3 (8.6)		

In the present study, out of 80 cases of PCOS, 12 patients had Hypothyroidism, one patient was hypertensive and, one patient had type II Diabetes mellitus.

Discussion

Polycystic ovarian syndrome (PCOS), originally described by Stein and Leventhal in 1935 as a constellation of oligo/amenorrhoea, hirsutism, obesity, infertility, and bilateral polycystic ovaries (later termed Stein–Leventhal syndrome), was initially thought to be a primary ovarian defect. It is now recognized as a multifaceted endocrine

and metabolic disorder affecting women of reproductive age, and the term has evolved from "polycystic ovarian disease (PCOD)" to "polycystic ovarian syndrome (PCOS)" to reflect its systemic implications [18].

PCOS is increasingly prevalent, likely due to changing lifestyles and improved diagnostic modalities. Cutaneous manifestations often serve as external indicators of underlying hormonal and metabolic disturbances and may be the earliest or sole clinical signs prompting medical evaluation.

In the present study involving 80 women with PCOS, the majority (53.8%) were aged between 20 and 30 years, comparable to findings by Shareef et al., who reported 46.6% in the 21–30 age group [19]. This supports the notion that PCOS primarily affects women in the reproductive age group. Although polycystic ovaries have been detected in girls as young as six, clinical diagnosis is usually established after puberty, typically when menstrual irregularities or dermatological complaints arise. Genetic predisposition, coupled with hormonal changes—particularly involving insulin and IGF-1 during puberty—play a pivotal role in disease manifestation.

A notable 60% of the study participants were unmarried, consistent with Shareef et al.'s findings (66.6%) [19]. Their study also indicated no statistically significant correlation between PCOS and age, marital status, or menstrual regularity. Only 9 patients (16%) had a positive family history of PCOS, which aligns with findings by Jayaram et al. and Singh et al., who reported rates of 5.7% [20, 21].

Acne vulgaris was present in 56.3% of the study participants. Jain et al. also reported acne in 59.5% of PCOS cases [22]. Among the 45 acne cases, the majority (84.4%) had Grade II acne, followed by Grade III (11.1%), and Grade I and IV (2.2% each). Contrary to typical presentations of severe, nodulocystic acne in PCOS, most cases in this study showed mild to moderate lesions—comedones, papules, and pustules—with minimal nodules or scarring. These findings are consistent with Singh et al., who observed mild to moderate acne in 64.3% of PCOS patients [21].

Striae were found in 39 (48.8%) patients, predominantly over the lower abdomen, buttocks, and thighs. All obese patients exhibited striae, indicating a strong association. Most cases presented with *striae alba*, while *striae rubra* was less common. **Hirsutism** was observed in 47.5% of participants, mainly involving the upper lip and chin. Comparable prevalence was noted by Jayaram et al. and Singh et al. (41.4%) [20, 21]. Prevalence rates of hirsutism in PCOS range from 28% to 76% across studies [23, 24], significantly higher than the ~5% prevalence in the general population [25].

Obesity was found in 50% of participants, with an additional 16.2% being overweight. This finding is similar to Jayaram et al. and Singh et al., who reported obesity in 54% of PCOS patients [20, 21]. Other studies, including those by Legro and Liou et al., report a broader range of 39%–73% [26]. **Acanthosis nigricans**, a marker of hyperinsulinemia, was seen in 38.6% of patients, commonly involving the neck. This aligns with Jain et al.'s 35.3% and Singh et al.'s 47.1% prevalence rates [21, 22]. **Seborrhea** was reported in 21.3% of patients, compared to 41.9% in Jain et al.'s study [22]. Seborrhea is commonly associated with inflammatory acne and often shows minimal response to conventional treatment. **Acrochordons** (skin tags) were observed in 18.8% of participants, slightly higher than the 11.8% reported by Jain et al. [22].

Menstrual irregularities were found in 56.25% of patients. Among these, oligomenorrhea was the most prevalent (85.7%), followed by amenorrhea (8.5%) and menorrhagia (2.8%). Only 43.75% had regular cycles—all of whom were unmarried. This is consistent with literature indicating that 85–90% of women with oligomenorrhea and 30–40% with amenorrhea may have PCOS [20, 28]. Sirmans et al. noted that although menstrual disturbances are common, around 20% of PCOS patients may have normal cycles [28].

Infertility was reported in 25.7% of cases, which corresponds closely with findings from Singh et al. (27.6%), Ramanand et al. (21%), and Jain et al. (33%) [21, 22, 26]. **Comorbidities** observed included hypothyroidism (15%), type II diabetes mellitus (1.3%), and hypertension (1.3%). The hypothyroidism prevalence is similar to Ramanand et al.'s finding of 13.3% [26]. Thyroid dysfunction in PCOS often manifests as subclinical hypothyroidism or autoimmune thyroiditis, both of which may predispose to overt hypothyroidism. According to Singla et al., thyroid autoimmunity and subclinical hypothyroidism are more common in PCOS [29]. Cibula et al. further noted increased rates of type II diabetes mellitus and cardiovascular disease in PCOS patients [30].

Conclusion

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age and is associated with multiple long-term health risks and significant psychological burden. Cutaneous manifestations such as acne vulgaris, hirsutism, striae, obesity, and acanthosis nigricans play a vital role in the early recognition and dermatological management of PCOS. The high incidence of these manifestations in affected individuals, as observed in this study, is consistent with previous research. Early identification of PCOS in women presenting with oligo-ovulation and hyperandrogenism provides a crucial opportunity to initiate timely intervention and long-term management of this multi-system disorder.

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