**ORIGINAL RESEARCH**

# A Cross-Sectional Study of Cutaneous Manifestations of Polycystic Ovarian Syndrome

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**ABSTRACT**

**Background and Aim:** Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders in women, affecting 5–10% of reproductive aged women. The dermatologic manifestations of hyperandrogenism, chiefly hirsutism, acne vulgaris, androgenic alopecia, and acanthosisnigricans, are among the cardinal manifestations of PCOS. The aim of this study was to determine the pattern and frequency of different cutaneous manifestations in PCOS patients and to correlate them with the hormonal profile.**Material and Methods:** A cross sectional study with a total 160 patients with features suggestive of PCOS attending department of dermatology, venereology and leprosy and department of obstetrics and gynecologies in a tertiary care Hospital of Gujarat were screened. Pregnant women and diagnosed cases of any other endocrine disorder were excluded. Hirsutism was assessed using Ferriman-Gallwey score and AGA according to Ludwig's classification. Serum hormonal profile including FSH, LH, prolactin, testosterone (free), DHEAS, TSH, FBS, fasting insulin were done. Insulin resistance was determined by calculating HOMA-IR score.**Results:** Mean age of incidence was 24.40 years.Ultrasonological evidence of PCOS changes was present in 90.62% patients. Patients with hirsutism (n=144) were found to have raised serum prolactin levels in 20.83% patients with a p value of 0.02. No statistically significant association was seen between hirsutism and other hormone levels.**Conclusion:** Polycystic ovarian syndrome (PCOS) is one of the most frequently encountered endocrine disorders in women of reproductive age group. The evaluation should include detailed menstrual history, information about the onset and duration of symptoms suggestive of hyperandrogenism and family history of PCOS and metabolic diseases.

**Key Words:**Hirsutism, Hyperandrogenism, Insulin, Polycystic ovary syndrome



## INTRODUCTION

Polycystic ovary syndrome (PCOS) (Stein–Leventhal syndrome) is a common hyperandrogenic disorder in women of the childbearing age group. It is a multisystem metabolic disorder, which has a major impact on the quality of life as well as fertility.[1,2] A revised definition of PCOS was proposed in 2003 at an international joint consensus meeting of the European Society for Human Reproduction and Embryology and the American Society for Reproductive Medicine.[3]According to Rotterdam 2003 diagnostic criteria of PCOS, PCOS could be diagnosed if two of the following three criteria are present: [4]

i. Oligoovulation and/or anovulation
ii. Hyperandrogenism
iii. Polycystic ovaries on ultrasound

Cutaneous changes are one of the earliest manifestations of PCOS, which include acne, hirsutism, androgenetic alopecia (AGA), stria, acanthosisnigricans (AN) and skin tags. As part of a multidisciplinary approach to these patients, dermatologists also play a major role in its management. A study by Gowri indicated that the prevalence of cutaneous manifestations of PCOS was nearly 90%.[5] A number of studies have shown that acne was the most common dermatological manifestation followed by hirsutism, then seborrhea, then AN and AGA.[5-8]

Hirsutism is defined as excessive growth of terminal hair in androgen-dependent areas in women. Acne is found in a large number of PCOS patients as

inflammatory lesions on the lower face, neck, chest, and upper aspect of the back. Although sole presence of acne is a potential marker of hyperandrogenism, it is clear that most acne patients do not have androgen excess.[6] Changes in physical appearance, such as hirsutism and obesity, seem to play the greatest role in the psychosocial manifestations.[9] Early diagnosis and early treatment may prevent metabolic complications and the psychological impact that may negatively impact the patient's quality of life.

The aim of this study was to determine the pattern and frequency of different cutaneous manifestations in PCOS patients and to correlate them with the hormonal profile.

## MATERIAL AND METHODS

A cross sectional study with a total 160 patients with features suggestive of PCOS attending department of dermatology, venereology and leprosy and department of obstetrics and gynecologies in a tertiary care Hospital of Gujarat were screened.

## INCLUSION CRITERIA

- All female patients with cutaneous manifestations of PCOS
- Menarche to menopause.

## EXCLUSION CRITERIA

i. Being a pregnant or breastfeeding woman.

ii. Presence of other associated comorbidities that lead to hormonal imbalance such as ovarian or adrenal neoplasm.

iii. Taking hormonal therapy such as oral contraceptives or antiandrogens

A detailed history of patients including age, marital status, family history, menstrual history, treatment history and history of infertility was taken. The body mass index (BMI) was calculated using the formula [weight (kg)/height (m)2 ]. Waist:hip ratio (WHR) was calculated with ≥0.85 considered to be abnormal.

Hirsutism was assessed using FerrimanGallwey (F-G) score, quantitating the presence of terminal hairs over nine body areas (i.e. upper lip, chin, chest, upper and lower abdomen, upper and lower back, upper arms and thighs). Hirsutism was defined as a Ferriman and Gallwey score >8. Androgenetic alopecia was evaluated according to Ludwig's classification.

To diagnose PCOS, patient's pelvic ultrasonography was done mid cycle. Hormonal profile was done on day 2 of menstrual cycle. For amenorrhoeic patients, blood was drawn on any day of the cycle. Fasting venous blood was drawn for FBS, FSH, LH, free testosterone, DHEAS, TSH, fasting insulin, prolactin levels.

Insulin resistance was determined by calculating Homeostatic model assessment of Insulin resistance (HOMA-IR) score. HOMA-IR = fasting glucose (mg/dL) × fasting insulin (μIU/mL) / 405.

Values >2.5 were taken as compatible with significant insulin resistance. Diagnosis of PCOS was made using Rotterdam's criteria.

## STATISTICAL ANALYSIS

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were described as means and standard deviations or median and interquartile range based on their distribution. Qualitative variables were presented as count and percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

## RESULTS

Total 160 female patients diagnosed to have PCOS according to Rotterdam's criteria were included in the study. Results obtained were tabulated and analyzed. Mean age of incidence was 24.40 years (Table 1) Ultrasonological evidence of PCOS changes was present in 90.62% patients (Table 2).

A total 81% patient had h/o irregular menses and 19% patients had regular menses. The mean BMI in the PCOS patients was 23.2 kg/m2. 48% patients had normal BMI.

A total 32.5% patients had Waist:Hip ratio more than 0.85 and hence increased risk of metabolic syndrome whereas 67.5% patients had Waist:Hip ratio less than 0.85. Table 3 shows the percentage of various cutaneous manifestations with hirsutism being the most common manifestation. The most common hormonal abnormality in the study patients was insulin resistance in 52.5% patients, followed by raised free testosterone in 18.5% patients and serum prolactin in 18% patients Hormonal levels were raised in almost all the patients with clinical manifestations of PCOS.Patients with hirsutism (n=144) were found to have raised serum prolactin levels in 20.83% patients with a p value of 0.02. No statistically significant association was seen between hirsutism and other hormone levels.

Statistically significant association was also present between seborrhea and BMI. No statistically significant association was seen between seborrhea and other hormone levels (p value >0.05).

There was a statistically significant association between AGA and insulin resistance. No statistically significant association was seen between acne, acanthosisnigricans, acrochordons and hormone levels (p value>0.05)

**Table 1: Age wise distribution of study participants**

| Age group (Years) | Number | Percentage (%) |
|---|---|---|
| **17-20** | 66 | 41.25 |
| **21-30** | 84 | 52.5 |
| **31-40** | 10 | 6.25 |
| **Total** | 160 | 100 |

**Table 2: Ultrasonological changes**

| USG | Number | Percentage (%) |
|---|---|---|
| PCOS | 145 | 90.62 |
| NO E/O PCOS | 15 | 9.37 |
| Total | 160 | 100 |

**Table 3: Percentage of cutaneous manifestations**

| Cutaneous manifestation | Number | Percentage (%) |
|---|---|---|
| Hirsutism | 144 | 87.5 |
| Acne | 118 | 73.75 |
| Seborrhea | 80 | 50 |
| AGA | 64 | 40 |
| Acanthosisnigricans | 42 | 26.25 |
| Acrochordons | 14 | 8.75 |

## DISCUSSION

Cutaneous manifestations of PCOS occur early in the course of the disease and play a role in diagnosis and in the therapeutic options. The vast majority of PCOS patients have attended or been referred to the dermatology clinics seeking management of these cutaneous manifestations. PCOS and its cutaneous features in particular affect the quality of life and the psychological well-being.[10]Therefore, we conducted this study to assess the prevalence, severity and characteristics of these cutaneous manifestations in Jordanian patients, in order to achieve careful assessment, timely and appropriate management, and reduction in psychological burden of PCOS.

The present study comprised of 160 female patients diagnosed to have PCOS according to Rotterdam's criteria and the pattern and frequency of cutaneous manifestations and their correlation with hormonal abnormalities was evaluated and compared. In this study, mean age of incidence was 24.40 years which was comparable with the studies carried out by Keen et al, Jain et al, while in a study by Mukkamala et al, mean age of incidence was 12.8 years.[11-13]

Although PCOS is a heterogeneous disorder without an easily identified single etiology, the key pathophysiologic components appear to include androgen excess, abnormal gonadotropin dynamics, and IR. Excess androgen production in the ovary impairs follicle maturation, leading to follicular atresia and decreased reproductive function. In addition, the resultant hyperandrogenemia may produce clinical hyperandrogenism. Whether due to an underlying primary hypothalamic defect in the gonadotropin releasing hormone (GnRH) pulse generator or a secondary effect of low levels of progesterone resulting from oligo- or anovulation[14] an increased pulse frequency of hypothalamic GnRH is thought to produce elevated levels of luteinizing hormone (LH) found in women with PCOS.[15]This increase in LH secretion relative to FSH stimulates production of androstenedione by ovarian theca cells. Insulin also plays a central role in PCOS pathophysiology, acting to increase androgen levels by direct and indirect mechanisms.[16]

In present study, 81% had history of irregular menses and 19% patients had regular menses which is comparable to other studies.[11-13] In this study, 27.5% of the patients were overweight and 24.5% were obese while in study by Ramanand et al, obesity was present in 54% patients and 16% patients were overweight, in study by Keen et al, obesity was present in 27% patients and 53% patients were overweight.[11,17]

Among cutaneous manifestations of PCOS, hirsutism was the most common finding occurring in 85% patients similar to study by Keen et al and Jain et al.[11,12] In contrast studies by Gowri et al, Hong et al, Fang et al showed acne to be the most common manifestation.[5,18,19]Mukkamala et al, found acanthosisnigricans as the most common presentation in cases of PCOS.[13] Some studies report a prevalence of hirsutism in women with PCOS in the range of 50–76%.[20,21]Saxena et al. in their study reported that the prevalence of hirsutism was 89% and 80% in obese and lean PCOS, respectively.[22] PCOS is the most common cause of hirsutism, it is responsible for nearly 70% of hirsutism cases, followed by idiopathic hirsutism (20%).[23] Moreover, it is considered to be the earliest cutaneous feature in PCOS.[24]

The most common hormonal abnormality in this study was insulin resistance in 525% patients, followed by raised free testosterone in 19.5% patients whereas in study by Gowri et al, raised testosterone levels in 55% patients was the most common manifestation.[5] In study by Keen et al, raised LH/FSH in 38% patients

followed by testosterone levels in 28% patients were the most common manifestations.[11]

In this study, a statistically significant association was present between hirsutism and serum prolactin levels. Raised prolactin levels were found in 5.5% patients in study by Keen et al, 13% by Spanda et al, and 8% by Jain et al.[11,12,25]However no significant association was found between hirsutism and serum prolactin levels in these studies.

A statistically significant association was also present between seborrhea and BMI. Patients with seborrhea had higher BMI indicating obesity in 12% patients and 32% patients being overweight. In addition to androgen hormones, the patient's genetic predisposition, and climate and emotional factors are other important factors affecting seborrhea. For these reasons, clinical, serological, and radiological examinations are important for the diagnosis of seborrhea related to PCOS. In a study by Al-Saeed et al, there was increased prevalence of seborrhoea in obese patients which was seen in 23.8% patients.[26] No significant association between obesity and seborrhea has been recorded in PCOS patients in other studies.

In present study, there was a statistically significant association between AGA and insulin resistance similar to study by Bakry et al, Matilainen et al, also reported a significantly higher value of fasting insulin in AGA cases than in the control group.[27,28]

After a thorough investigation of the literature on hormonal abnormalities and correlation between these abnormalities and cutaneous manifestation of PCOS, we found equivocal and varied results. The factors that play a role in this variation are different genetic architectures and PCOS phenotypes, ethnicity and different available hormonal assays. [21,23]

The findings of this study have to be seen in the light of some limitations. The first includes the effect of previous or current therapies (e.g. topical and systemic acne therapy, topical minoxidil, hair reducing therapy and weight control measures) on the clinical presentation, which could not be minimized. Additionally, as with all cross-sectional studies which provide only a view at single point in time: these findings might differ if another time interval had been used.

## CONCLUSION

Polycystic ovarian syndrome (PCOS) is one of the most frequently encountered endocrine disorders in women of reproductive age group. The evaluation should include detailed menstrual history, information about the onset and duration of symptoms suggestive of hyperandrogenism and family history of PCOS and metabolic diseases. A multidisciplinary approach should be followed in dealing with a case of PCOS with involvement of a gynecologist, dermatologist, endocrinologist, psychiatrics and nutritionist in order to put a proper management plan and reduce the physical and psychological burden of the disease.

Authors recommend performing endocrinological work up, investigation of coexisting hyperandrogenic states, and evaluation of polycystic ovary syndrome in all patients with hirsutism. PCOS has many potential metabolic and cardiovascular risks if not managed appropriately, thus proper diagnosis and management is essential.

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