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Original Research Article

Study of cutaneous manifestations of polycystic ovarian syndrome

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ABSTRACT

Background: Polycystic ovarian syndrome (PCOS) is one of the most frequently encountered endocrine disorders that occurs in as many as 4 to 10% of women of reproductive age group. It presents with a series of skin changes including acne, hirsutism, seborrhea, androgenetic alopecia (AGA) and acanthosis nigricans. Aim of the study was to determine the prevalence and frequency of different cutaneous manifestations in PCOS patients and to correlate them with the degree of hormonal abnormalities.

Methods: A total 100 patients with features of PCOS who presented to department of dermatology, gynecology (January 2018-December 2019) with cutaneous manifestations were recorded and diagnosis of PCOS was made using Rotterdam's criteria. 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: Among cutaneous manifestations of PCOS, hirsutism (85%) was the most common finding followed by acne (73%), seborrhea (50%), AGA (36%), acanthosis nigricans (29%) and acrochordons (9%). The most common hormonal abnormality was insulin resistance in 53% patients, followed by raised free testosterone in 19% and serum prolactin in 18% patients. A statistically significant association was present between AGA and insulin resistance, hirsutism and raised prolactin levels, seborrhea and raised body mass index ($p < 0.05$).

Conclusions: Dermatological manifestations of PCOS play a significant role in making the diagnosis and constitute a substantial portion of the symptoms experienced by women with this syndrome.

Keywords: Acne, Acanthosis nigricans, Androgenetic alopecia, Hirsutism, Polycystic ovarian syndrome, Seborrhea

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is one of the most frequently encountered endocrine disorders that occurs in as many as 4 to 10% of women of reproductive age group.¹ The excessive secretion of androgens in PCOS patients results in a series of skin changes including hirsutism, acne, seborrhea, androgenetic alopecia, acanthosis nigricans and acrochordons.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.^{3,4}

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.⁵ Changes in physical appearance, such as hirsutism and obesity, seem to play the greatest role in the psychosocial

manifestations.⁶ Early diagnosis and early treatment may prevent metabolic complications and the psychological impact that may negatively impact the patient's quality of life.

Hence, 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.

METHODS

A cross sectional study with a total 100 patients with features suggestive of PCOS attending department of dermatology, venereology and leprosy and department of obstetrics and gynecology in a tertiary care Hospital of Ludhiana were screened.

Inclusion criteria

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

Exclusion criteria

- Pregnant women
- Diagnosed case of any other endocrine disorder (eg. hypothyroidism, hyperprolactinemia, congenital adrenal hyperplasia)
- Patients taking medications like oral contraceptive pills
- Patients unwilling to participate in the study.

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 Ferriman Gallwey (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.

$$\text{HOMA-IR} = \text{fasting glucose (mg/dL)} \times \text{fasting insulin (\mu IU/mL)} / 405$$

Values > 2.5 were taken as compatible with significant insulin resistance.

Diagnosis of PCOS was made using Rotterdam's criteria.

Statistical analysis

For comparing categorical data, Chi square (χ^2) test was performed and exact test was used when the expected frequency is less than 5. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS 21 (Statistical Package for the Social Science).

RESULTS

A total 100 female patients diagnosed to have PCOS according to Rotterdam's criteria were included in the study. Results obtained were tabulated and analysed. Mean age of incidence was 23.04 years (Table 1).

Table 1: Age distribution.

Age group	No. of cases	Percentage
17-20	38	38%
21-30	55	55%
31-40	7	7%
Total	100	100%

Ultrasonological evidence of PCOS changes was present in 90% patients (Table 2).

Table 2: Ultrasonological changes.

USG	No. of cases	Percentage
PCOS	90	90%
NO E/O PCOS	10	10%
Total	100	100%

Table 3: Percentage of cutaneous manifestations.

Cutaneous manifestation	No. of cases	Percentage
Hirsutism	85	85%
Acne	73	73%
Seborrhea	50	50%
AGA	36	36%
Acanthosis nigricans	29	29%
Acrochordons	9	9%

A total 82% patients had h/o irregular menses and 18% patients had regular menses. The mean BMI in the PCOS patients was 23 kg/m² with standard deviation of 2.781. 48% patients had normal BMI. 52% females had increased BMI, including 28% being overweight and 24% being obese.

Table 4: Increased hormone levels in the study group.

Hormone levels	Percentage of patients
FSH	5%
LH	17%
LH/FSH	16%
Free testosterone	19%
DHEAS	5%
S. Prolactin	18%
TSH	7%
HOMA IR	53%

A total 33% patients had Waist:Hip ratio more than 0.85 and hence increased risk of metabolic syndrome whereas 67% 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 53% patients, followed

by raised free testosterone in 19% patients and serum prolactin in 18% patients (Table 4).

Table 5 shows correlation of skin changes with hormonal changes. Hormonal levels were raised in almost all the patients with clinical manifestations of PCOS.

Table 6 shows the presence of a statistically significant association between hirsutism and serum prolactin levels. Patients with hirsutism (n=85) were found to have raised serum prolactin levels in 21.2% patients with a p value of 0.049. No statistically significant association was seen between hirsutism and other hormone levels (FSH, LH, free testosterone, DHEAS, TSH, FBS, fasting insulin).

Table 7 shows a statistically significant association was also present between seborrhea and BMI. Patients with seborrhea (n=50) had higher BMI indicating obesity in 12% patients and 32% patients being overweight with a p value of 0.019. No statistically significant association was seen between seborrhea and other hormone levels (p value >0.05).

Table 5: Correlation of cutaneous manifestations with increased hormone levels.

Cutaneous manifestations	FSH	LH	LH/FSH	Testosterone (free)	DHEAS	Prolactin	TSH	HOMA-IR
Hirsutism	5	15	15	15	5	18	6	48
Acne	2	12	11	16	5	14	6	42
Seborrhea	2	10	10	13	3	10	2	31
AGA	1	7	9	7	1	9	2	24
AN	3	2	3	6	2	4	3	17
Acrochordons	0	1	1	3	0	3	0	6

Table 6: Correlation of hirsutism with prolactin level.

		Hirsutism		Total	Chi-square value	p value		
		Yes (n = 85)	No (n = 15)					
S. Prolactin	Raised	18	21.2%	0	0.0%	18	3.874	0.049

Table 7: Correlation of seborrhea with body mass index.

		Seborrhea		Total	Chi-square value	p value		
		Yes (n = 50)	No (n = 50)					
BMI group	Normal	28	56.0%	20	40.0%	48	7.905	0.019
	Obesity	6	12.0%	18	36.0%			
	Overweight	16	32.0%	12	24.0%			

Table 8: Correlation of aga with insulin resistance of women in the study group.

		AGA		Total	Chi-square value	p value		
		Yes (n = 36)	No (n = 64)					
HOMA-IR	Raised	24	66.7%	29	45.3%	53	4.218	0.04

Table 8 depicts there was a statistically significant association between AGA and insulin resistance. Patients with AGA (n=36) were found to have raised HOMA - IR

scores occurring in 66.7% patients with a p value of 0.04. No statistically significant association was seen between

acne, acanthosis nigricans, acrochordons and hormone levels (p value >0.05).

DISCUSSION

Patients with PCOS presented to us with hirsutism and acne being their main concern with additional features of androgenetic alopecia, seborrhea, acanthosis nigricans and acrochordons.

The present study comprised of 100 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 23.04 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.⁷⁻⁹

In present study, 82% had history of irregular menses and 18% patients had regular menses which is comparable to other studies.^{7,9,10}

In this study, 28% of the patients were overweight and 24% 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.^{7,10}

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.^{7,8} In contrast studies by Gowri et al, Hong et al, Fang et al showed acne to be the most common manifestation.^{2,11,12} Mukkamala et al, found acanthosis nigricans as the most common presentation in cases of PCOS.⁹

The most common hormonal abnormality in this study was insulin resistance in 53% patients, followed by raised free testosterone in 19% patients whereas in study by Gowri et al, raised testosterone levels in 55% patients was the most common manifestation.² In study by Keen et al, raised LH/FSH in 38% patients followed by testosterone levels in 28% patients were the most common manifestations.⁷

In this study, a statistically significant association was present between hirsutism and serum prolactin levels. Raised prolactin levels were found in 5% patients in study by Keen et al, 13% by Spanda et al, and 8% by Jain et al.^{7,8,13} However no significant association was found between hirsutism and serum prolactin levels in these studies.

No statistically significant association was seen between acne and hormone levels (p value >0.05) in present study while Emiroğlu et al, investigated the presence of insulin

resistance in patients with severe acne vulgaris and found a positive correlation between insulin resistance and severe acne vulgaris.¹⁴

A statistically significant association was also present between seborrhea and BMI. Patients with seborrhea (n-50) had higher BMI indicating obesity in 12% patients and 32% patients being overweight.

In a study by Al-Saeed et al, there was increased prevalence of seborrhea in obese patients which was seen in 23.8% patients.¹⁵ 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.^{16,17}

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.

Dermatological manifestations may provide early clinical clues to the recognition of PCOS, and treatment of these cutaneous conditions may improve the patient's quality of life and psychological well-being. If history and physical examination do not delineate the underlying cause, laboratory testing can be helpful. Other etiologies of hyperandrogenism (congenital adrenal hyperplasias, androgen-secreting tumours, Cushing's syndrome) should be ruled out.

So, 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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Ethical approval: The study was approved by the Institutional Ethics Committee

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