

Original Article

Prevalence of polycystic ovary syndrome in women with acne: hormone profiles and clinical findings

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Abstract *Background* Polycystic ovary syndrome (PCOS) is the most common endocrine disorder and is the leading cause of hyperandrogenemia in women. Acne vulgaris is also a common cutaneous manifestation of hyperandrogenism.

Objective To determine the prevalence of PCOS in patients with acne and its associated factors with regard to the clinical and paraclinical findings.

Patients and methods In this cross-sectional study, 118 women with acne referred to various clinics of dermatology were enrolled. A clinical examination was followed by a laboratory examination, including hormone profile and ovarian sonography. Confirmation of PCOS was based on the diagnostic criteria of the National Institute of Health (NIH) and the sonographic findings.

Results The subjects were 14-38 years old. PCOS was diagnosed in 57 (48.3%) patients by sonography methods, while, 71 (60.2%) patients were diagnosed as PCOS cases based on the NIH criteria. Around 54% of the patients complained of hirsutism and 37% of them suffered from menstrual disturbances. PCOS versus non-PCOS had profiles of prolactin (19.36 ± 11.96 ng/ml vs. 17.31 ± 9.29 ng/ml), testosterone (0.80 ± 0.57 pg/ml vs. 0.93 ± 0.98 pg/ml), and dehydroepiandrosterone levels (2.48 ± 1.98 μ g/dl vs. 1.97 ± 1.02 μ g/dl), which were not statistically different ($p > 0.05$). The luteinizing hormone to follicular stimulating hormone ratio was significantly higher in PCOS ($p = 0.01$).

Conclusion According to the findings of this study, PCOS is a common disorder among women with acne. Although PCOS was expected to correspond with a specific hormonal profile, our study showed that most of the PCOS patients had normal levels of tested hormones. Therefore, we recommend that sonographic evaluation be one of the core examinations in the diagnosis of PCOS in women having acne.

Key words

Acne, hyperandrogenism, polycystic ovarian syndrome, sonography

Introduction

Acne is a common manifestation of hyperandrogenemia. Numerous factors

contribute to the development of acne. Androgenic stimulation of sebaceous glands is one of the important factors in its development.¹ The amount of excess sebum production correlates with the severity of acne. Increased sensitivity to androgenic hormones has also been reported to be a contributing factor.² The enzyme 5-alpha reductase converts testosterone to the more potent androgen dihydrotestosterone

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within the sebaceous glands. Current studies indicate the influence of neuropeptides and congenital factors in the development of acne.²

Acne by itself is a serious cosmetic disorder, but it could also be a sign of an underlying disease.³ In females, the most common cause of hyperandrogenemia is the polycystic ovary syndrome (PCOS), which affects 5-10% of this population.⁴ One of the important etiologic factors of acne is the increased activity of sebaceous glands, which are androgen-dependent. Increasing the level of androgenic products by decreasing sex hormone binding globulin (SHBG), plays a key role in the pathogenesis of acne.^{2,5}

The etiology of PCOS is not clearly understood. There is, however, a fair amount of evidence indicating the influence of genetic factors. The occurrence of this syndrome clusters in families and a high prevalence in first-degree relatives, about five to six times higher than in the general population, may indicate its genetic basis.⁶ PCOS is the most common endocrine disorder among women during their reproductive period. The diagnosis of PCOS is usually confirmed by certain clinical findings including menstrual disturbances, hyperandrogenism, and an increase in the level of androgenic products from ovaries.³ The cutaneous manifestations of increased androgenic hormones are hirsutism, acne, seborrhea, alopecia, obesity, and acanthosis nigricans. On the basis of the NIH meeting in 2003, any two of the three are sufficient to confirm the diagnosis of PCOS: (1) specific morphology of polycystic ovaries in ultrasonography findings, (2) hyperandrogenism (biochemical or clinical), and (3) oligo- or amenorrhoea.⁶

Seirafi *et al.*⁷ showed that the prevalence of PCOS in women with acne was about 40%.

Walton *et al*⁸ reported that in 5.5% of the acne cases, PCO could be observed. However, they did not report the prevalence of the syndrome, but only focused on PCO. As they mentioned, there was a controversy in the prevalence of PCOS among patients with acne. Also, the association of clinical manifestations and paraclinical findings was not explored in detail.

The objective of this study was to determine the prevalence of PCOS in patients with acne and its associated factors with regard to the clinical and paraclinical findings among Iranian women living in the Kerman province.

Patients and methods

The population of this study included women with acne vulgaris referred to clinics of dermatology during 2007. The subjects were selected consecutively. On the basis of a previous study of 60 cases in 2001,⁹ where the prevalence of PCOS in acne was 45%, we assumed a confidence interval of 95% and expected an error of 9%. In this study, sample size was calculated to be 118 patients.

Pregnant women and those who received oral contraceptives were excluded from the study. All the eligible subjects were informed about the objective of the study and they then signed the informed consents. Medical history was taken and physical examination was performed on all patients, to register their demographic data and menstrual-related characteristics during the last two years. Oligomenorrhea (menstrual cycle more than 40 days) and amenorrhea (having no menstrual cycle for at least 12 months) were regarded as menstrual disturbances.

Anthropometric indices including weight and height were measured using the standard methods. Overweight was defined as BMI >25 kg/m². With regard to paraclinical evaluations,

pelvic sonography in the early follicular phase (days 5-9 of the menstrual cycle) was carried out by same sonographer in all cases. Polycystic ovaries were diagnosed for those having 12 or more follicles in either ovary (2-9 mm in diameter) accompanied with an increase in the ovarian density. Hormonal assessment included serum levels of prolactin, luteinizing hormone (LH), follicle-stimulating hormone (FSH), testosterone, and dehydroepiandrosterone (DHEA), by using the radioimmunoassay method (DIAPLUS, USA). Finally, PCOS was diagnosed by the NIH diagnostic criteria.

All the data were statistically analyzed by SPSS version 11.5. The categorical variables were examined by chi-square and the means were compared by t student test among two groups. The level of significance was considered as $p < 0.05$.

Results

The data from 118 women with the mean age of 22.1 ± 4.2 years were analyzed. Obesity (BMI ≥ 25) was detected in 20 (27.3%), hirsutism in 64 (54.2%), and menstrual disturbance in 44 (37.3%) of the subjects.

They reported that the acne lesions appeared when they were 16.4 ± 3.7 years old. The most affected body areas were the face, thorax, and back, respectively. On the basis of ovarian sonography, polycystic ovaries were diagnosed in 57 (48.3%) of the cases. According to the NIH diagnosis criteria, 71 (60.2%) of them were diagnosed with PCOS.

The relationship between PCOS and other determinants is reported in **Table 1**. In this study obesity was reported in 20.8% of the PCOS group and in 38.5% of the other group ($p=0.1$). The prevalence of hirsutism was similar among women with and without PCOS (54.9% vs.

Table 1 Comparison of clinical features of acne patients diagnosed as polycystic ovary syndrome (PCOS) and non-PCOS.

	PCOS N=71	Non-PCOS N=37
Obesity	20.8%	38.5%
Hirsutism	54.9%	53.2%
Menstrual irregularities*	61.9%	-

* $p \leq 0.05$

Table 2 Comparison of mean serum hormone levels in patients with acne diagnosed as polycystic ovary syndrome (PCOS) and non-PCOS.

	PCOS N=71	Non-PCOS N=37
Prolactin (ng/ml)	19.36 ± 11.96	17.31 ± 9.29
Testosterone (pg/ml)	0.80 ± 0.57	0.97 ± 0.98
DHEA ($\mu\text{g/dl}$)	2.48 ± 1.98	1.97 ± 1.02
LH/FSH ratio*	2.15 ± 2.13	1.33 ± 1.17

DHEA=Dehydroepiandrosterone, * $p \leq 0.05$

53.2%) ($p=0.8$). Menstrual disturbance was only seen in women with PCOS (61.9%) ($p=0.001$).

The mean serum levels of prolactin, testosterone and DHEA in two groups as shown in **Table 2**. The testosterone level was lower in the PCOS group (0.80 pg/ml vs. 0.93 pg/ml), which is not statistically significant ($p=0.08$). Only the LH/FSH ratio differed significantly between PCOS and the control ($p=0.01$).

Discussion

PCOS is the most common female endocrinopathy, affecting 5-10% of the female population. Overproduction of the ovarian androgens usually leads to a heterogeneous range of symptoms including hirsutism, acne, insulin resistance, obesity, and cardiovascular disease.

The frequency of PCOS in the general population is expected to be around 5%,⁴ which indicates that acne patients are about ten times more prone to having PCOS than the general population. On the basis of the findings, PCOS was diagnosed in about 60% of the patients suffering from acne. In the study of Peserico *et*

*al.*¹⁰ on 119 women with acne (excluding those with obesity, hirsutism, and menstrual disturbance) and 35 normal women as control group, PCOS was diagnosed in 45.4% of the cases while it was detected only in 17.1% of the controls. In our study, we estimated the prevalence of PCOS to be around 48%, which is compatible to the previous reports. Such findings indicated that PCOS is a common disorder in patients with acne and it could be completely free of symptoms of hirsutism and obesity.

In a study on 90 women, over 17 years of age, with acne, hirsutism was documented in 19 (21%) subjects, elevated levels of at least one androgen in 73 (81%) subjects, menstrual disturbances were reported by 43 (48%) women, and polycystic ovaries were found in 45 (50%) women. The authors indicated that the severity of acne manifestation in adult women is not determined by androgen production.¹¹ Similarly, we also found no significant differences between PCOS and the normal group regarding the levels of prolactin, testosterone, and dehydroepiandrosterone. Only the LH/FSH ratio was a significant factor when comparing two groups, which indicated that such a factor was the prominent hormonal disturbance in PCOS.

Findings from other studies,^{4,10,12} also showed a higher prevalence of polycystic ovaries and PCOS in acne patients as compared with the control group. Bunker *et al.*¹² reported that 83% of women with acne had polycystic ovaries as compared to 19% in the control group. Those with polycystic ovaries mostly had a normal medical examination in both the clinical and endocrinological findings. These findings were supported by Timpatanapong *et al.*³ who reported PCOS in 37.3% of patients with acne and none in the control group. Thirty-nine percent of the acne patients suffered from

abnormal menstruation. Finally, they reported no statistically significant difference in LH, FSH, or sex hormone binding globulin of patients with acne in comparison with the control group.³

In Walton's study, among 36 females with acne only two patients had polycystic ovaries.⁸ Seven patients had irregular menses and none had evidence of hirsutism. The authors reported that the severity of acne highly correlated with the androgenic hormone. Their findings differed from what we found in our study, which could be due to highly selected samples. They excluded those patients with severe acne.

In another study, 35 white women with adult onset acne and hirsutism were compared with 35 white women with adult acne without hirsutism; PCOS was reported in 57.1% and 28.6%, respectively. The authors concluded that patients presenting with adult-onset acne and hirsutism had a higher risk of PCOS.⁷ This finding was not seen in our study as both hirsute and non-hirsute patients had a similar prevalence of PCOS.

Conclusion

The results of this study indicate that the polycystic ovarian syndrome is a common disorder in Iranian women with acne and not necessarily associated with clinical signs and symptoms such as obesity or hirsutism. Menstrual disorder and LH/FSH ratio were the most important predictors of PCOS in women with acne.

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