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Frequency of Polycystic Ovarian Syndrome In Women Presenting with Acne Vulgaris – A Cross-Sectional Study

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ABSTRACT

Objective: To study the frequency of polycystic ovarian syndrome (PCOS) in women presenting with acne vulgaris in Dermatology outpatient department (OPD).

Study Design: Analytical cross-sectional study.

Place and Duration of Study: Department of Dermatology, Pak Emirates Military Hospital (PEMH), Rawalpindi, Pakistan, from May to Oct 2024.

Methodology: The study enrolled 104 women presenting to Dermatology OPD with face acne. Patients diagnosed with acne vulgaris by a dermatologist were advised blood tests for Luteinizing Hormone (LH)/ Follicle-stimulating hormone (FSH) ratio and pelvic ultrasound for ovarian cysts. Rotterdam Criteria were used to diagnose PCOS. The frequency of PCOS in acne vulgaris patients was assessed, along with the association of acne severity with PCOS and menstrual irregularities, and the relationship between Body Mass Index (BMI) and PCOS. Chi-square analysis was used to determine association between acne vulgaris and PCOS.

Results: The median age of enrolled patients was 33.50(14.00) years, and median BMI was 25.00(4.00) kg/m^2. All patients had acne vulgaris, which was graded using Global Acne Grading System (GAGS) where 34(32.70%) patients had mild acne, 30(28.80%) moderate, 21(20.20%) had moderately severe acne while severe acne was seen in 19(18.30%) patients. From the study population, PCOS was diagnosed using the Rotterdam Criteria in 42(40.40%) acne vulgaris patients and 62(59.60%) acne patients did not have underlying PCOS. Menstrual abnormalities were the most common clinical feature observed in the entire study population (n=104), with 52(50%) patients reporting oligomenorrhoea.

Conclusion: Underlying PCOS is frequent finding in women presenting with acne vulgaris, particularly with associated symptoms like hirsutism and menstrual irregularities.

Keywords: Acne vulgaris, Global Acne Grading Scale (GAGS), Hirsutism, Hyperandrogenism, Polycystic Ovarian Syndrome (PCOS)

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INTRODUCTION

Acne vulgaris is a chronic inflammatory disease of pilosebaceous units, characterized by various lesions such as comedones, papules, pustules, nodules, and cysts.[1] It commonly affects the face, neck, upper trunk, and upper arms, significantly impacting the quality of life of those affected.[2] While acne is typically associated with adolescence and often coincides with the onset of puberty, it can persist into adulthood due to hormonal fluctuations.[3] Acne vulgaris affects 9.40% women globally.[4] Androgens play a crucial role in its development and severity by acting on sebaceous glands while hyperandrogenism can cause acne's persistence into adulthood [5] as the severity of acne is closely linked to excess sebum production driven by increased androgen sensitivity especially in women, where elevated androgen levels or heightened androgen sensitivity, particularly in Polycystic Ovarian Syndrome (PCOS), significantly contribute to acne development. PCOS, a prevalent endocrine disorder, affects 4-18% of women of reproductive age globally, with the highest frequency observed in the Pakistani population being up to 52%.[6] It is characterized by hyperandrogenism, insulin resistance, and polycystic ovaries with cardinal symptoms including acne, hirsutism, obesity and secondary infertility.[7] According to the Rotterdam Criteria, diagnosis of PCOS requires the presence of two out of three features: ovarian dysfunction, hyperandrogenism, and polycystic ovaries detected via pelvic ultrasound.[8] Several studies have highlighted that acne vulgaris is one of the most

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common (75.30%) and earliest dermatological manifestations of PCOS followed by hirsutism (59.60%), seborrhea (43.20%) alopecia (42.50%).[9] Despite the well-established link between acne and PCOS, research on the frequency of PCOS among women with acne is limited, especially in Pakistan.[10] This study aimed at investigating the frequency of PCOS in women presenting with acne to help prevent complications related to undiagnosed PCOS, including metabolic and cardiovascular disorders, and address cosmetic concerns that can significantly affect mental health.

METHODOLOGY

This analytical cross-sectional study was conducted at PEMH, Rawalpindi, over a period of 6 months, from May to October 2024, following approval from the hospital Ethics Review Board (vide reference no. A/28/ER/521/23). Informed, written consent was taken from the patients in Dermatology OPD before inclusion in the study. A sample size of 73 was calculated using OpenEpi online sample size calculator by taking a confidence interval of 95%, a margin of error of 5%, and a reported prevalence of acne vulgaris in Pakistani women at 5%.4 However, a total of 104 eligible participants were recruited and included in the final analysis to improve the statistical power and better reflect the study population.

Inclusion Criteria: All female patients of ages 18 to 50 years, presenting with acne vulgaris, of any severity or duration to Dermatology OPD were included.

Exclusion Criteria: Patients suffering from a chronic comorbid conditions and endocrine disorders including diabetes mellitus, Cushing syndrome, thyroid disease, congenital adrenal hyperplasia, or those on hormonal replacement therapy were excluded.

All included patients were assessed by a dermatologist to diagnose acne vulgaris of any severity based on GAGS, advised blood test including Complete Blood Count (CBC), Thyroid Stimulating Hormone, serum cortisol (0800-0900 hrs), LH/FSH ratio, and a pelvic ultrasound by a radiologist to detect the presence of ovarian cysts were advised. Rotterdam Criteria was used to diagnose patients with PCOS including hyperandrogenism, ovulation abnormalities and polycystic ovaries on USG. Other potential causes of hyperandrogenism including Congenital Adrenal Hyperplasia (CAH), Cushing syndrome and thyroid dysfunction were excluded. Data was collected using a specialized proforma designed for this study. Variables including age, grading of acne as per GAGS, 2-hour blood glucose in oral glucose tolerance test (OGTT), BMI, smoking history, menstrual and reproductive history, family history of PCOS and clinical manifestations of PCOS including hirsutism, alopecia, and acne were noted. Primary outcome of the study was to observe the frequency of PCOS in Acne vulgaris patients as per Rotterdam criteria including hyperandrogenism, ovulation abnormalities and polycystic ovaries on USG. Secondary outcomes included association of severity of acne with PCOS and menstrual irregularities, relationship between BMI and PCOS in acne vulgaris patients and frequency of insulin resistance as depicted by an impaired glucose tolerance in OGTT. Data was analyzed using Statistical Package for Social Sciences (SPSS) software version 25.00. Continuous variables which were found non-normally distributed were presented as Median and interquartile ranges (IQR), whereas categorical variables were presented as frequencies. Chi-square test and Fisher exact test was used to check association of acne vulgaris and PCOS where a p-value of ≤ 0.05 was considered significant.

RESULTS

This study included 104 patients with a median age of 33.50(14.00) years, and a median BMI of 25.00(4.00) kg/m2. All patients had acne vulgaris, which was graded using GAGS with 34(32.70%) patients having mild acne, 30(28.80%) with moderate, 21(20.20%) with moderately severe acne and severe acne in 19(18.30%) patients. PCOS was diagnosed using the Rotterdam Criteria in 42(40.40%) acne vulgaris patients and 62(59.60%) acne patients did not have underlying PCOS as shown in Table-I. The frequency of PCOS did not vary with the severity of acne vulgaris (p=0.58).

Table-I: Studied Parameters of Acne Patients (n=104)

Variable		Values
Age [median(IQR) years]		33.50(14.00)
*BMI [median(IQR) kg/m2]		25.00(4.00)
Marital Status	Married	672(95.00%)
	Unmarried	35(5.00%)
Smoking	Yes	85 (81.70%)
	No	19 (18.30%)
Acne Severity on GAGS	Mild	34 (32.70%)
	Moderate	30 (28.80%)
	Moderately Severe	21 (20.20%)
	Very Severe	19 (18.30%)
PCOS	Yes	42 (40.40%)
	No	62 (59.60%)

**BMI: Body Mass Index, GAGS: Global Acne Grading Scale, PCOS: Polycystic Ovarian Syndrome*

The signs of PCOS that were observed in association with females presenting with complaints

of acne have been summarized in Table-II. PCOS patients had more BMI in the overweight range as compared to those without PCOS (p<0.0001). However, there was no difference between these groups (p=0.391) with regards to obesity (BMI≥30kg/m^2).

Menstrual abnormalities were the most common clinical feature observed in the entire study population (n=104), with 52(50.00%) patients reporting oligomenorrhoea. Patients having severe or moderately severe acne vulgaris (n=40) as per GAGS had a greater incidence of hirsutism with 18(45.00%) patients reporting hirsutism as compared to 17(26.56%) of those having mild or moderate disease (n=64) (p=0.053) as shown in Table-II.

Table-II: Clinical Features of PCOS Among Acne Vulgaris Patients with PCOS vs Without PCOS (n=104)

Clinical Feature		PCOS (n=42)	No PCOS (n=62)	*p*-value
Dysmenorrhea	Yes	24 (23.08%)	26 (25.00%)	0.128
	No	18 (17.31%)	36 (34.62%)	
Menstrual Irregularities	Normal	9 (8.65%)	15 (14.42%)	<0.001
	Oligomenorrhoea	33 (31.73%)	19 (18.27%)	
	Amenorrhea	0 (0.00%)	28 (26.92%)	
Hirsutism	Yes	18 (17.31%)	17 (16.35%)	0.102
	No	24 (23.08%)	45 (43.27%)	
Alopecia	Yes	8 (7.69%)	24 (23.08%)	0.033
	No	34 (32.69%)	38 (36.54%)	
Obesity	Yes	3 (2.88%)	2 (1.92%)	0.360
	No	39 (37.50%)	60 (57.69%)	
Impaired Glucose Tolerance	Yes	23 (22.12%)	15 (14.42%)	0.001
	No	19 (18.27%)	47 (45.19%)	
Acanthosis Nigricans	Yes	28 (26.92%)	13 (12.50%)	<0.001
	No	14 (13.46%)	49 (47.12%)	
Family History of PCOS	Yes	25 (24.04%)	17 (16.35%)	0.001
	No	17 (16.35%)	45 (43.27%)	

DISCUSSION

This study was conducted in acne vulgaris patients for presence of PCOS but the condition did not correlate with acne severity (p=0.58). However, in this study, significant associations were observed between PCOS and higher BMI, oligomenorrhoea, acanthosis nigricans, impaired glucose tolerance, and family history of PCOS (p<0.05). In recent years, dermatological manifestations have been considered the earliest and most common clinical presentations of PCOS, including hirsutism, alopecia, and acne.[11] In one study, around 20-40% females with PCOS were noted to have acne, making it mandatory for acne patients to be considered for screening and evaluation of underlying PCOS.[12] Similarly, another author explained that PCOS was diagnosed in 31(25.83%) patients presenting with acne having mean GAGS score of 15.57 ± 4.04.[13] In another study, 30-40% females with PCOS presented with acne vulgaris of variable severity, along with increased incidence of insulin resistance in both acne and PCOS.[14] Patients with acne were subsequently noted to have underline PCOS diagnosed using Rotterdam Criteria, where high androgen levels were of pivotal value in acne vulgaris presentation in females with undiagnosed PCOS.[15] In this study, PCOS patients had BMI trends in the overweight range more as compared to those without PCOS (p<0.0001). However, there was no difference between these groups (p=0.391) as regards to obesity (BMI≥30kg/m^2). Higher BMI correlated with more skin areas involvement (ρ=0.23, P<0.01) and acne severity (ρ=0.33, P<0.001) as observed by one author[16] with 30% (95% CI 21.89-39.58%) prevalence of PCOS in acne patients, with higher BMI and hirsutism being significantly strong risk factors.[17] Similarly, a strong association between higher BMI and acne severity with pooled odds ratio 2.36 (95% CI; 1.97-2.83) for higher BMI in reference to normal BMI was noted in another study.[18] In our study, menstrual irregularities, particularly oligomenorrhoea, were the most common clinical feature in PCOS patients, affecting 31.73% of those diagnosed. One study showed that PCOS was diagnosed in 48.10% females having acne vulgaris with irregular menstruation being the most common associated symptom.[19]

Another study found that 81% patients presenting with acne had PCOS and were suffering from menstrual irregularities (OR: 1.02, 95% CI: 0.37-2.7, p=0.97) and hirsutism (OR: 1.17, 95% CI: 0.43-3.24) in comparison to patients without PCOS.20 Another author concluded that prevalence of acne was 1.6 folds increased in females with PCOS as compared to without PCOS 43% (95% CI; 41-45%) versus 21% (95% CI; 19-22%).[21] Similarly, increased levels of androgen were noted to be elevated in 50-60% females presenting with acne suggesting acne as a form of androgen excess.[22]

LIMITATIONS OF STUDY

The study has several limitations, being a single center study with limited sample size. Serum testosterone and prolactin levels were not measured in our study cohort due to resource constraints and non-availability of highly accurate assays. Hormonal changes and levels were not mutually compared in the acne patients with PCOS and without PCOS. Also, dietary and lifestyle habits were not observed and compared in patients having PCOS and those who did not have underlying PCOS.

CONCLUSION

PCOS was frequent in women presenting with acne vulgaris and regular testing for underlying hormonal irregularities and screening for PCOS can prove beneficial for acne vulgaris patients which can help these patients by adopting a more holistic approach towards the problem.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

AM & MFS: Data acquisition, data analysis, critical review, approval of the final version to be published.

MKA & AA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AS & MTI: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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