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ORIGINAL ARTICLE

Frequency of Polycystic Ovary Syndrome in Female Patients with Acne Vulgaris — A Cross-Sectional Study

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ABSTRACT

Background: *Acne vulgaris is a common dermatological condition frequently encountered in women of reproductive age. Emerging evidence suggests a significant association between persistent acne and polycystic ovary syndrome (PCOS), a complex endocrine disorder characterized by hyperandrogenism, menstrual irregularities, and metabolic disturbances. Early identification of PCOS among acne patients is critical for timely management and prevention of long-term complications.* ***Aim of the study:*** *To determine the frequency of PCOS among women presenting with acne vulgaris and to evaluate the associated clinical and anthropometric characteristics.* ***Methods & Materials:*** *This hospital-based, cross-sectional study included 136 women diagnosed with acne vulgaris attending the outpatient Dermatology and Venereology department of Combined Military Hospital, Dhaka, between December 2022 and May 2023. Socio-demographic data, clinical presentations, menstrual history, and anthropometric measurements were recorded. PCOS diagnosis was based on clinical criteria including hyperandrogenic features and menstrual disturbances. Statistical analyses compared clinical parameters between acne patients with and without PCOS.* ***Result:*** *The prevalence of PCOS among acne patients was 36.8%. Women with PCOS showed significantly higher frequencies of hirsutism (88.0% vs. 3.49%, $p < 0.001$), alopecia (38.0% vs. 8.14%, $p < 0.001$), obesity (42.0% vs. 10.47%, $p < 0.001$), acanthosis nigricans (66.0% vs. 9.30%, $p < 0.001$), and menstrual disturbances (62.0% vs. 11.63%, $p < 0.001$) compared to non-PCOS acne patients. Seborrhea was more common in PCOS patients but did not reach statistical significance (58.0% vs. 41.86%, $p = 0.069$). The mean BMI was significantly higher in the PCOS group.* ***Conclusion:*** *The present study demonstrates a high prevalence of PCOS among women with acne vulgaris, particularly in those exhibiting hyperandrogenic and metabolic features. These findings emphasize the importance of routine PCOS screening in dermatological practice to enable early diagnosis and multidisciplinary care.*

Keywords: *Polycystic ovary syndrome, acne vulgaris, hyperandrogenism, hirsutism, menstrual irregularities, obesity*

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INTRODUCTION

Acne vulgaris is a common, chronic, and multifactorial inflammatory skin disorder that affects approximately 9.8% of women globally[1]. Its prevalence is particularly high during adolescence, typically diminishing in adulthood and becoming uncommon after menopause[2]. The development and persistence of acne are influenced by various intrinsic and extrinsic factors, including age, ethnicity, dietary habits, emotional stress, smoking, and hormonal fluctuations[3]. The pathophysiology of acne involves five core mechanisms: follicular hyperkeratinization, increased sebum production, inflammation, colonization of the pilosebaceous unit by Cutibacterium acnes (formerly Propionibacterium acnes), and hormonal influences most notably the action of androgens on

sebaceous glands[4]. Polycystic ovary syndrome (PCOS), one of the most common endocrine disorders in women of reproductive age, affects an estimated 6–10% of this population[5]. It is defined by the presence of oligo- or anovulation, clinical or biochemical signs of hyperandrogenism, and polycystic ovarian morphology on ultrasound, as outlined in the Rotterdam criteria[6]. Clinically, PCOS presents with a wide spectrum of symptoms including menstrual irregularities, infertility, and metabolic abnormalities[7]. Cutaneous manifestations are also prevalent and may include acne, seborrhea, hirsutism, and androgenetic alopecia, with hirsutism being the most frequently observed, occurring in approximately 65–75% of cases[8]. Acne, while less common, is present in about 15–25% of PCOS patients[9]. Although hyperandrogenism is a recognized pathogenic factor in acne development due to its stimulatory effect on sebaceous gland activity and follicular keratinization, a significant proportion of women with acne do not display measurable biochemical hyperandrogenism[10]. Nevertheless, acne may serve as an early dermatological indicator of underlying endocrine dysfunction, particularly in women with additional signs such as hirsutism, obesity, or menstrual irregularities. Studies suggest that hirsutism is found in 20–30% of women with acne[11], while the prevalence of PCOS among acne patients ranges from 20–40%, suggesting a notable overlap between the two conditions[9]. It is important to note, however, that acne may not always be the direct result of PCOS but could arise due to secondary factors commonly associated with the syndrome, such as insulin resistance, poor dietary patterns, psychosocial stress, or the use of comedogenic skincare products[12]. Given these associations, it is recommended that women presenting with persistent, treatment-resistant acne particularly when accompanied by signs of androgen excess—undergo screening for PCOS[13]. Early recognition and diagnosis of PCOS are essential due to its long-term implications, including increased risk of infertility, metabolic syndrome, type 2 diabetes, cardiovascular disease, and endometrial cancer[14]. Despite increasing awareness, the exact prevalence of PCOS in women presenting with acne vulgaris remains underexplored in many populations. Therefore, the aim of this study is to determine the frequency of polycystic ovary syndrome in women presenting with acne vulgaris, thereby contributing to improved diagnostic insight and management strategies for both conditions.

METHODS & MATERIALS

This hospital-based, cross-sectional study was conducted in the Outpatient Department of Dermatology and Venereology at Combined Military Hospital (CMH), Dhaka. The study was carried out over a six-month period, from December 2022 to May 2023.

Study Population

A total of 136 female patients presenting with acne vulgaris were recruited consecutively during the study period using a non-probability consecutive sampling technique. All participants attended the dermatology outpatient clinic of CMH, Dhaka.

Inclusion Criteria

- Women diagnosed with acne vulgaris.
- Women of reproductive (childbearing) age.
- Patients who provided written informed consent for pelvic ultrasonography.
- Patients who consented to undergo relevant blood investigations.

Exclusion Criteria

- Patients with known systemic comorbidities including diabetes mellitus, hypertension, ischemic heart disease, thyroid disorders, or systemic autoimmune diseases.
- Patients currently or recently (within 3 months) using hormonal therapy, corticosteroids, or oral contraceptive pills.
- Patients unwilling to provide informed consent.

Study Variables and Data Collection

Data were collected using a structured format encompassing demographic, clinical, hormonal, and radiological variables. Demographic and clinical parameters included age, menstrual history (cycle length, regularity, duration of bleeding), body weight, height, body mass index (BMI), duration and type of acne, distribution of lesions, and signs of hyperandrogenism such as hirsutism. Acne severity was graded clinically as mild, moderate, or severe. BMI was calculated using the standard formula: weight in kilograms divided by height in meters squared (kg/m^2). Menstrual irregularity was defined as having fewer than nine periods per year or menstrual cycles exceeding 40 days, in the absence of pregnancy.Pelvic ultrasonography (USG) was performed in all participants to assess ovarian morphology. A 3.5 MHz transabdominal probe was used for unmarried women employing the full bladder technique, while a 5 MHz transvaginal probe was used for married participants. The diagnosis of polycystic ovary (PCO) was established based on the presence of multiple small (2–8 mm) subcapsular cysts with dense echogenic stroma. PCO was not diagnosed in cases with randomly distributed cysts lacking stromal echogenicity.Hormonal evaluation included serum concentrations of total testosterone, luteinizing hormone (LH), and follicle-stimulating hormone (FSH). Blood samples were collected in a fasting state and analyzed using radioimmunoassay methods. The diagnosis of polycystic ovary syndrome (PCOS) was based on the presence of acne with menstrual irregularities and either clinical signs of hyperandrogenism or a serum LH/FSH ratio ≥2 and/or ultrasonographic findings consistent with PCO morphology.

Statistical Analysis

All data were checked for completeness, consistency, and accuracy. Data entry and analysis were performed using IBM SPSS Statistics version 23.0 (IBM Corp., Armonk, NY). Descriptive statistics were used to summarize the data. Continuous variables were expressed as mean ± standard

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deviation (SD), and categorical variables were presented as frequencies and percentages. Group comparisons were conducted using the Chi-square test for categorical variables and unpaired Student's t-test for continuous variables. A p-value <0.05 was considered statistically significant with a 95% confidence interval.

Ethical Considerations

The study protocol received approval from the Institutional Ethics Committee of Combined Military Hospital, Dhaka. Informed written consent was obtained from all participants prior to enrollment. Participant confidentiality and anonymity were maintained throughout the study in accordance with the ethical principles of the Declaration of Helsinki.

RESULT

A cross-sectional study was conducted among a total of 136 childbearing women presenting with acne vulgaris in the Department of Dermatology and Venereology of Combined Military Hospital (CMH), Dhaka. The primary objective was to determine the frequency of polycystic ovarian syndrome (PCOS) in this population. The findings revealed that 50 participants out of 136 were diagnosed with PCOS, indicating a frequency of 36.8% (Figure 1). The mean age of the participants was 27.9±5.6 years, ranging from 18 to 39 years. A majority of the participants were aged 25 years or older. Most of the patients were married and had attained higher education. A large proportion were students, with a monthly income of over 10,000 and residing in urban areas, as demonstrated in (Table I). Clinical presentation analysis revealed that papular acne was the most frequent manifestation, followed by pustule, comedone, and nodule. Regarding the duration of acne, two-thirds of the patients had a disease history of 1 to 3 months. Cheeks were the most commonly involved sites, followed by different regions of the face and forehead (Table II). The mean age at first appearance of acne was 17.8±0.7 years. The mean menstrual cycle length was 32.8±6.2 days. The minimum and maximum durations of menstrual bleeding were 4.1±1.3 days and 6.5±1.5 days, respectively. The mean body mass index (BMI) of the respondents was 24.13±4.2 kg/m^2 (Table III). Clinical features such as hirsutism were present in 44 out of 50 women with PCOS but only 3 out of 86 women without PCOS. Alopecia was observed in 19 PCOS patients and 7 without PCOS. Obesity was present in 21 PCOS cases and 9 without. Acanthosis nigricans was seen in 33 PCOS patients but only 8 of the non-PCOS group. Menstrual disturbance was reported by 31 PCOS women and only 10 without PCOS. Seborrhoea was more common among PCOS patients (29 out of 50), although the difference was not statistically significant. These differences in clinical features are presented in Table IV.

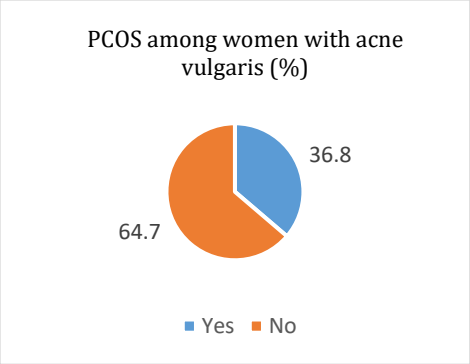

Figure – 1: Prevalence of Polycystic Ovary Syndrome (PCOS) among women presenting with acne vulgaris

Table – I: Socio-demographic profile of the study population (*n*=136)

Variable	Frequency (n)	Percentage (%)
Age (years)		
<25	48	35.29
≥25	88	64.71
Mean ± SD	27.9 ± 5.6	18 - 39
Marital Status		
Married	95	69.85
Unmarried	41	30.15
Education		
Illiterate	9	6.62
Primary	4	2.94
Secondary	27	19.85
Higher	96	70.59
Occupation		
Housewife	43	31.62
Service	34	25.00
Student	59	43.38
Income		
≤10,000	37	27.21
>10,000	99	72.79
Residence		
Rural	53	38.97
Urban	83	61.03

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Table – II: Clinical presentation profile of women with acne vulgaris.

Clinical presentation	Frequency (n)	Percentage (%)
Clinical Manifestations		
Acne Comedone	41	30.15
Acne papule	98	72.06
Acne nodule	33	24.26
Acne pustule	53	38.97
Duration of disease (month)		
1 – 3	91	66.91
4 - 6	45	33.09
Site of Involvement		
Right side of cheek	73	53.68
Left side of cheek	69	50.74
Right side of forehead	18	13.24
Left side of forehead	20	14.71
Right side of face	22	16.18
Left site of face	21	15.44

Table – III: Menstrual and anthropometric characteristics of the Study Population

Variable	Mean ± SD
Age of respondents (years)	27.9 ± 5.8
Age at first acne (years)	17.8 ± 0.7
Length of menstrual cycle (days)	32.8 ± 6.2
Minimum duration of menstrual bleeding (days)	4.1 ± 1.3
Maximum duration of menstrual bleeding (days)	6.5 ± 1.5
Body Mass Index (BMI, kg/m^2)	24.13 ± 4.2

Table – IV: Clinical findings of the study population

Clinical Finding	Acne patients with PCOS	Acne patients without PCOS	p-value
Hirsutism			
Present	44 (88.00)	3 (3.49)	<0.001
Absent	6 (12.00)	83 (96.51)	
Seborrhoea			
Present	29 (58.00)	36 (41.86)	0.069
Absent	21 (42.00)	50 (58.14)	
Alopecia			
Present	19 (38.00)	7 (8.14)	<0.001
Absent	31 (62.00)	79 (91.86)	
Obesity			
Present	21 (42.00)	9 (10.47)	<0.001
Absent	29 (58.00)	77 (89.5)	
Acanthosis Nigricans			
Present	33 (66.00)	8 (9.30)	<0.001
Absent	17 (34.00)	78 (90.70)	
Menstrual disturbance			
Present	31 (62.00)	10 (11.63)	<0.001
Absent	19 (38.00)	76 (88.37)	

DISCUSSION

Polycystic ovary syndrome (PCOS) has emerged as one of the most common endocrine disorders affecting women of reproductive age, often manifesting through a constellation of dermatological, metabolic, and reproductive symptoms[15,16]. Among these, acne vulgaris frequently serves as an early clinical indicator, particularly when persistent, treatment-resistant, or occurring beyond adolescence[16]. Recent insights into the pathophysiology of PCOS have highlighted the role of hyperandrogenism, insulin resistance, and inflammatory mediators—mechanisms that also contribute to acne development[17]. Consequently, acne is increasingly recognized not merely as a cosmetic concern but as a potential dermatologic marker of systemic hormonal imbalance[18]. In this context, identifying the prevalence of PCOS among acne patients is critical for timely diagnosis and intervention. In the present study, the prevalence of polycystic ovary syndrome (PCOS) among women with acne vulgaris was found to be

36.8%, which is consistent with findings from previous studies indicating a strong association between acne and PCOS. A hospital-based observational study conducted by Shareef et al. in India reported a similar prevalence rate of 30% among women presenting with acne, highlighting the relevance of dermatological symptoms as early indicators of reproductive endocrinopathies[19]. Similarly, a cross-sectional study by Bliede et al. at Tishreen University Hospital in Syria identified PCOS in 34% of women with acne, further supporting the dermatological–endocrine link[20]. Our study population primarily consisted of women aged 18 to 39 years, with a mean age of 27.9 ± 5.6 years, aligning with the typical age range of PCOS onset reported in the literature[19,20]. Furthermore, the majority of participants (64.71%) were aged ≥25 years. Comparable results were reported by Maluki (2010), who documented a mean age of 25.02 ± 6.04 years, with participants ranging from 17 to 40 years[21]. Similarly, Schmidt et al. conducted a retrospective cross-sectional study at the University of California, San Francisco, including 401 women with suspected PCOS, where the median age was 28 years[22]. Our analysis of clinical features showed that acne papules (72.06%) and pustules (38.97%) were predominant. Notably, PCOS was significantly associated with other androgenic manifestations. Hirsutism, a hallmark of hyperandrogenemia, was present in 88% of acne patients with PCOS, compared to only 3.49% in those without PCOS ($p < 0.001$). Consistent with the findings reported by Maluki (2010), the prevalence of hirsutism was markedly elevated in acne patients diagnosed with PCOS (88.0%) compared to those without PCOS (3.5%)[21]. Hirsutism serves as a critical clinical marker of hyperandrogenemia and constitutes a key diagnostic criterion for PCOS, as demonstrated in the study by Sharquie et al. (2007) and corroborated by subsequent research[23]. Alopecia (38% vs 8.14%, $p < 0.001$), acanthosis nigricans (66% vs 9.3%, $p < 0.001$), and obesity (42% vs 10.47%, $p < 0.001$) were also significantly more common among PCOS cases. Keen et al. (2017) reported a comparable frequency of alopecia (31%) and acanthosis nigricans (30%) among Indian women with PCOS[24]. Similarly, a Jordanian study observed alopecia in 42.5% of PCOS patients, with acanthosis nigricans and other cutaneous signs being significantly more common in overweight and obese individuals[25]. Avila et al. (2014) noted that 53% of PCOS patients had acanthosis nigricans, strongly associated with obesity and insulin resistance[26]. A multicenter study from southern India also demonstrated a high prevalence of acanthosis nigricans (56%) among PCOS women, particularly those with elevated BMI[27]. Acanthosis nigricans, in particular, serves as a visible marker of insulin resistance—a central feature of PCOS. Taieb et al. emphasized that insulin resistance not only contributes to metabolic risk but also amplifies androgen production, exacerbating both acne and other cutaneous symptoms[28]. Additionally, menstrual irregularity was reported by 62% of PCOS patients compared to just 11.63% of non-PCOS individuals ($p < 0.001$). The mean menstrual cycle length in the overall population was 32.8 ± 6.2 days, suggestive of oligo-ovulation or anovulation in many cases. This is very similar to a study performed by Sharquie et al.[23]. This finding also consisted with the study of Norman et al. (2007), Ehrmann, 2005 and Chang and Katz (1999)[29-31]. Although seborrhea was observed more frequently among PCOS patients (58%) compared to non-PCOS patients (41.86%), this difference was not statistically significant ($p = 0.069$). Gowri et al. reported that 52.5% of women with PCOS exhibited seborrhea, making it one of the most common dermatological manifestations after acne and hirsutism[32]. In a study conducted by Artar et al., an even higher prevalence of seborrhea (89.4%) was observed among PCOS subjects, indicating a strong dermatological association with hyperandrogenism[33]. Similarly, an Egyptian study by Abdelazim et al. identified seborrhea in 27.6% of PCOS patients, with no statistically significant correlation found between seborrhea and hormonal parameters such as LH/FSH ratio or serum testosterone ($p > 0.5$)[34].

Limitations of the study:

Every hospital-based study has some limitations and the present study undertaken is no exception to this fact. The present study's cross-sectional design restricts causal inferences regarding the relationship between acne vulgaris and PCOS. Additionally, diagnosis of PCOS was primarily clinical without confirmatory hormonal assays or ultrasonographic evaluation, potentially affecting diagnostic accuracy. The single-center, hospital-based setting may limit the generalizability of findings to the wider population, especially in rural or underserved areas. Furthermore, selection bias may exist due to the consecutive sampling method. Future studies with larger, multicenter cohorts and comprehensive biochemical and imaging assessments are warranted to validate and extend these findings.

CONCLUSION AND RECOMMENDATIONS

The present study demonstrates a high frequency of polycystic ovary syndrome (PCOS) among women with acne vulgaris, with 36.8% affected. Clinical features such as hirsutism, alopecia, acanthosis nigricans, obesity, and menstrual irregularities were significantly associated with PCOS, underscoring the multifaceted nature of this endocrine disorder. These findings highlight the importance of routine screening for PCOS in women presenting with acne, especially those exhibiting hyperandrogenic or metabolic signs. Early identification and integrated management can improve dermatologic and systemic outcomes, emphasizing the critical role of multidisciplinary approaches in optimizing patient care.

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