CLINICAL AND PHENOTYPIC FEATURES OF POLYCYSTIC OVARY SYNDROME: ASSOCIATION WITH HORMONAL AND ANTHROPOMETRIC PARAMETERS

Shakhnoza S. Makhmadullayeva - Ph.D. student
Dilorom K. Najmutdinova - D.M.Sc., professor
Tashkent state medical university (Tashkent, Uzbekistan)
diloromnajmutdinova@gmail.com

Abstract. Background*: Polycystic ovary syndrome (PCOS) represents a multifaceted endocrine disorder characterized by both reproductive and metabolic dysfunctions. Objective: The aim of this study is to assess the clinical and phenotypic characteristics of PCOS and their correlation with hormonal and anthropometric metrics. Methods: A cross-sectional analysis involving 29 women diagnosed with PCOS was performed. The severity of hirsutism was evaluated using the Ferriman–Gallwey (FG) scoring system. Hormonal assessments encompassed total testosterone and dehydroepiandrosterone sulfate (DHEAS). The body mass index (BMI) was computed. Non-parametric statistical techniques, including Spearman correlations, Kruskal–Wallis testing, and logistic regression analysis, were employed. Results: A significant difference in age was observed across various hirsutism severity classifications (p = 0.036). Total testosterone exhibited a positive correlation with the FG score (r = 0.385, p = 0.048); however, this significance diminished after statistical adjustment. No significant association was found between BMI and DHEAS with respect to clinical severity. Logistic regression analysis indicated that age serves as an independent predictor of moderate-to-severe hirsutism (OR = 1.57, p = 0.033). Conclusion: Age and serum testosterone levels appear to exert a more substantial influence on hirsutism severity compared to BMI or adrenal androgens. These findings advocate for a tailored approach to the assessment and management of PCOS.*

Keywords: *PCOS, hirsutism, testosterone, DHEAS, BMI, hormonal profile, phenotypic features*

Introduction.

Polycystic ovary syndrome (PCOS) represents a predominant endocrine disorder affecting women of reproductive age, characterized by a diverse array of clinical, biochemical, and morphological characteristics. This condition impacts approximately 6–20% of women globally, contingent upon the diagnostic criteria employed, and constitutes a significant contributor to anovulatory infertility, menstrual irregularities, and hyperandrogenism. Beyond its implications for reproductive health, PCOS is increasingly acknowledged as a multifaceted metabolic disorder associated with insulin resistance, obesity, dyslipidemia, and an augmented risk of type 2 diabetes and cardiovascular diseases. The multifactorial nature of PCOS accentuates the necessity of assessing both phenotypic presentations and the underlying hormonal and anthropometric variables.

The clinical presentations of PCOS exhibit considerable variability, encompassing oligomenorrhea and amenorrhea, as well as hirsutism, acne, and androgenic alopecia. This heterogeneity has facilitated the identification of various phenotypic subtypes, each indicative of differing extents of reproductive and metabolic involvement. Hormonal dysregulations—most notably elevated luteinizing hormone (LH), hyperandrogenemia, and aberrant gonadotropin secretion—are pivotal in the pathophysiology of PCOS. Furthermore, metabolic anomalies such as hyperinsulinemia and heightened insulin resistance are intimately associated with ovarian dysfunction and androgen excess. These endocrine disruptions may also be modulated by anthropometric factors, including body mass index (BMI), waist-to-hip ratio, and overall adiposity, which further complicate the presentation and trajectory of the disease.

Contemporary research underscores that anthropometric variables serve not only as indicators of metabolic risk but also as significant modifiers of hormonal profiles in women diagnosed with

PCOS. Obesity, particularly central adiposity, has been correlated with more pronounced clinical manifestations, including menstrual irregularities, ovulatory dysfunction, and aggravated hyperandrogenic traits. Nevertheless, PCOS can also manifest in women with normative BMI, indicating that body composition and fat distribution may hold greater relevance than total weight alone. Thus, comprehending the interplay between phenotypic attributes, hormonal disturbances, and anthropometric indices is paramount for enhancing diagnostic precision, risk stratification, and personalized therapeutic strategies.

Despite the accumulating evidence regarding the metabolic and endocrine dimensions of PCOS, the relationship between clinical phenotypes and specific hormonal and anthropometric parameters remains inadequately elucidated, particularly across diverse populations. Disparities in ethnicity, lifestyle, and genetic predisposition may influence variations in disease manifestation, underscoring the necessity for population-specific investigations. A thorough assessment of clinical and phenotypic attributes in relation to hormonal and anthropometric measures may yield critical insights into the underlying mechanisms of PCOS and facilitate the development of targeted management strategies.

Consequently, the objective of this study is to explore the clinical and phenotypic characteristics of PCOS and to evaluate their correlation with hormonal profiles and anthropometric parameters in women of reproductive age. This research aspires to elucidate the interconnections among endocrine, metabolic, and physical characteristics of PCOS, thereby contributing to a more refined comprehension of the syndrome and promoting enhanced diagnostic and therapeutic methodologies.

Material and Methods of research.

Study design and participants

This cross-sectional study included 29 women diagnosed with polycystic ovary syndrome (PCOS)**.** Clinical, anthropometric, and hormonal data were collected and analyzed to evaluate associations between phenotypic features of PCOS, androgen levels, and body composition parameters. Age was calculated as the difference between the study year (2026) and the participant's birth year.

Clinical and phenotypic assessment

Hirsutism severity was evaluated using the Ferriman–Gallwey (FG) scoring system**,** and participants were categorized into three groups:

- **Mild hirsutism:** FG ≤ 8
- **Moderate hirsutism:** FG 9–12
- **Severe hirsutism:** FG ≥ 13

Anthropometric assessment included measurement of body mass index (BMI, kg/m²). Hormonal evaluation included serum total testosterone (ng/mL) and dehydroepiandrosterone sulfate (DHEAS, µg/dL).

Statistical analysis

Data analysis was conducted using descriptive and non-parametric statistical methods due to the non-normal distribution of androgen markers. Normality of continuous variables was assessed using the Shapiro–Wilk test. Approximately normally distributed variables were expressed as mean ± standard deviation (SD)**,** while non-normally distributed variables were presented as median and interquartile range (IQR)**.**

Associations between continuous variables were examined using Spearman's rank correlation coefficient. To control for multiple comparisons, false discovery rate (FDR)–adjusted p-values were reported where appropriate.

Comparisons across hirsutism severity groups were performed using the Kruskal–Wallis test**,** with epsilon-squared (ε^2) calculated as a measure of effect size.

To identify independent predictors of hirsutism severity, a binary logistic regression model was constructed, comparing women with moderate/severe hirsutism (FG ≥ 9) to those with mild hirsutism (FG ≤ 8). Predictor variables entered simultaneously into the model included age, BMI, total testosterone, and DHEAS. Results were expressed as odds ratios (ORs) with 95% confidence intervals (CIs). Model discrimination was evaluated using the receiver operating characteristic (ROC) curve and area under the curve (AUC).

All statistical tests were two-sided, and a p-value < 0.05 was considered statistically significant.

Results of research

1. Normality Assessment

The distribution of continuous variables was evaluated using the Shapiro–Wilk test. Age, BMI, and Ferriman–Gallwey (FG) scores demonstrated approximately normal distributions, while total testosterone and DHEAS showed significant deviations from normality.

Table 1.

Shapiro–Wilk normality test results

Variable	N	W	p-value
Age (years)	29	0.940	0.1018
BMI (kg/m²)	29	0.977	0.7568
Total testosterone (ng/mL)	27	0.829	0.00046
DHEAS (µg/dL)	29	0.765	<0.001
Ferriman–Gallwey score	29	0.956	0.2635

Because androgen markers were non-normally distributed, non-parametric statistical methods were applied in subsequent analyses.

2. Descriptive Characteristics of the Study Population

The study included 29 women with PCOS. Mean age was 25.07 ± 3.34 years, and mean BMI was 26.65 ± 3.77 kg/m², indicating that most participants were within the overweight range. Median testosterone and DHEAS values suggested mild to moderate biochemical hyperandrogenism.

Table 2.

Overall descriptive statistics

Variable	n	Summary
Age (years)	29	25.07 ± 3.34
BMI (kg/m²)	29	26.65 ± 3.77
Total testosterone (ng/mL)	27	1.20 (0.66–2.92)
DHEAS (µg/dL)	29	315.40 (296.30–381.70)
FG score	29	8.97 ± 2.65

Participants were divided into mild (n=13), moderate (n=13), and severe (n=3) hirsutism groups.

3. Clinical and Hormonal Characteristics by Hirsutism Severity

Age increased progressively with hirsutism severity. Women with severe hirsutism were older than those with mild symptoms. BMI showed only minor variation between groups.

Total testosterone concentrations exhibited a consistent increase correlating with elevated FG scores, indicating a dose–response association between androgen concentrations and the severity of hirsutism. Conversely, DHEAS levels did not reveal a discernible linear pattern.

Table 3.

Characteristics by hirsutism severity

Variable	Mild	Moderate	Severe
Age (years)	23.0	26.0	29.0
BMI (kg/m²)	25.2	26.6	27.4
Testosterone (ng/mL)	0.76	1.98	4.00
DHEAS (µg/dL)	315.4	315.6	291.3

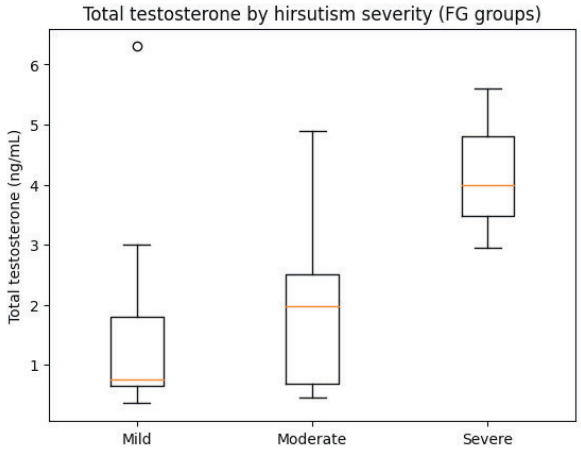


Figure 1.

These findings suggest that increasing hirsutism severity is associated with higher testosterone concentrations but not necessarily with changes in DHEAS levels.

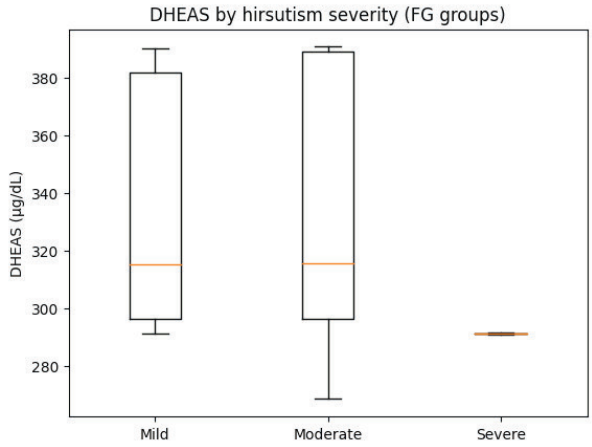


Figure 2.

4. Correlation Analysis

Spearman correlation analysis demonstrated a positive association between FG score and total testosterone ($r = 0.385$, $p = 0.048$), indicating that higher androgen levels corresponded to more severe clinical hirsutism. Table 4.

No significant correlations were observed between FG score and BMI or DHEAS. Age showed a non-significant negative correlation with DHEAS.

Table 4.

Spearman correlations

Pair	r	p-value
FG vc Testosterone	0.385	0.048
FG vs DHEAS	-0.157	0.416
FG vs BMI	0.074	0.705

After correction for multiple comparisons, the correlation between FG score and testosterone lost statistical significance, likely due to the limited sample size. Figure 3.

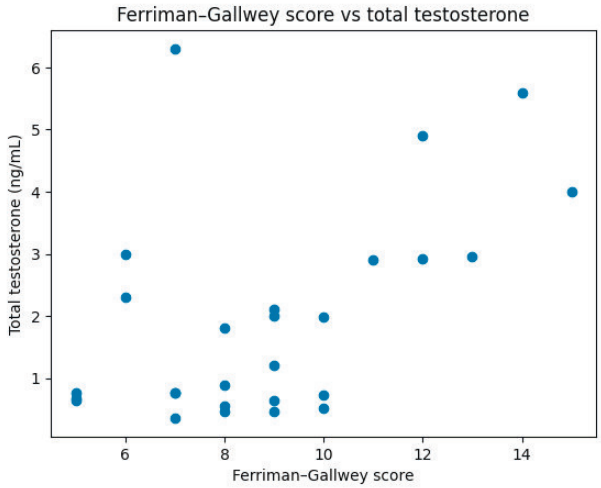


Figure 3.

5. Group Comparisons

The Kruskal–Wallis test revealed a statistically significant difference in age across hirsutism severity groups (p = 0.036), with a moderate effect size. Differences in testosterone and DHEAS approached significance but did not reach conventional thresholds.

Table 5.

Kruskal–Wallis test results

Variable	H	p-value
Age	6,635	0.036
BMI	0.556	0.757
Testosterone	5.732	0,057
DHEAS	5.732	0.068

These findings suggest that age may play a role in clinical severity, while hormonal markers show a possible trend that warrants further investigation.

6. Multivariable Logistic Regression

Binary logistic regression identified age as an independent predictor of moderate-to-severe hirsutism (OR = 1.57, p = 0.033). BMI, testosterone, and DHEAS were not significant predictors in the multivariable model.

Discussion.

This investigation examined the clinical and phenotypic attributes of females diagnosed with polycystic ovary syndrome (PCOS) and assessed their correlations with hormonal and anthropometric

variables. The results indicate that the severity of hirsutism correlates with age and exhibits a positive association with serum testosterone concentrations, while no discernible connection was identified with body mass index (BMI) or dehydroepiandrosterone sulfate (DHEAS). These findings augment the expanding corpus of literature suggesting that the clinical manifestations of PCOS are shaped by a multifaceted interplay of endocrine and individual determinants, rather than being attributable to a singular hormonal factor.

A salient finding of this inquiry is the notable age disparity observed among various hirsutism severity classifications, with older females exhibiting a higher likelihood of presenting with moderate-to-severe hirsutism. This observation may imply that extended exposure to elevated androgen levels contributes to the progressive manifestation of clinical symptoms over time. Furthermore, age persisted as an independent predictor of hirsutism severity within the multivariable logistic regression framework, thereby underscoring the potential cumulative impact of endocrine dysregulation associated with PCOS. This finding is congruent with prior studies indicating that hyperandrogenic characteristics may become increasingly pronounced with advancing reproductive age.

The analysis further unveiled a positive correlation between the Ferriman–Gallwey (FG) score and total testosterone levels. Although this correlation did not sustain statistical significance following adjustments for multiple comparisons, the observed trend lends biological credibility to the notion that circulating androgens influence the severity of hirsutism. The progressive elevation of testosterone levels across severity classifications further implies a dose–response relationship. These findings resonate with established pathophysiological paradigms of PCOS, wherein ovarian androgen excess occupies a pivotal role in the emergence of clinical hyperandrogenism.

Conversely, DHEAS levels failed to exhibit a clear association with the severity of hirsutism. This may suggest that adrenal androgens exert a less preeminent influence on phenotypic expression relative to ovarian testosterone sources. Alternatively, variability in adrenal functionality among individuals with PCOS could account for the lack of a consistent trend. The absence of a robust relationship between DHEAS and clinical manifestations has also been documented in other investigations, implying that DHEAS may serve as a more pertinent diagnostic marker rather than as a prognostic indicator of symptom severity.

Anthropometric measures, particularly BMI, did not exhibit significant correlations with the severity of hirsutism within this cohort. Although obesity is frequently associated with insulin resistance and the exacerbation of PCOS symptoms, the results of this study indicate that body mass alone may not directly affect the extent of clinical hyperandrogenism. It is plausible that body fat distribution or metabolic parameters, as opposed to BMI per se, play a more crucial role in influencing hormonal dynamics. This underscores the heterogeneity inherent in PCOS and accentuates the necessity for individualized assessments.

Several limitations merit acknowledgment. The relatively limited sample size may have curtailed statistical power, particularly in subgroup analyses, potentially elucidating why certain associations did not achieve statistical significance. The cross-sectional design further constrains causal interpretations of the findings. Additionally, the study concentrated on a specific population, which may impact the generalizability of the results to broader demographic cohorts.

Despite these limitations, this study provides valuable insights into the relationship between clinical presentation and hormonal profiles in PCOS. The findings underscore the importance of considering age and androgen levels when evaluating hirsutism severity and support the need for comprehensive phenotypic assessment. Future research involving larger, longitudinal cohorts is warranted to further clarify the temporal relationship between hormonal changes and clinical manifestations of PCOS.

In conclusion, the results suggest that age and serum testosterone levels may play a more prominent role in determining hirsutism severity than anthropometric measures or adrenal androgen

levels. These findings contribute to a more nuanced understanding of PCOS phenotypes and may inform more personalized approaches to diagnosis and management.

Conclusion.

This study highlights the complex interplay between clinical presentation, hormonal profiles, and anthropometric parameters in women with polycystic ovary syndrome (PCOS). The findings indicate that hirsutism severity is more closely associated with age and serum testosterone levels than with body mass index or DHEAS concentrations. Women with more pronounced clinical hyperandrogenism tended to be older and demonstrated higher circulating testosterone levels, suggesting a cumulative effect of androgen exposure over time.

The absence of a strong relationship between BMI and hirsutism severity emphasizes the heterogeneity of PCOS and suggests that anthropometric measures alone may not adequately predict clinical manifestations of hyperandrogenism. Similarly, the limited association between DHEAS levels and phenotypic severity indicates that adrenal androgens may play a secondary role compared to ovarian sources of androgen excess.

Overall, these results underscore the importance of comprehensive clinical and hormonal assessment in the evaluation of PCOS. Understanding the variability in phenotypic expression may contribute to more individualized diagnostic and management strategies. Future studies involving larger and more diverse populations, as well as longitudinal designs, are needed to further clarify the mechanisms underlying clinical variability in PCOS and to improve evidence-based approaches to patient care.

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