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Case study

Polycystic Ovary Syndrome and Mental Health Outcomes in Women of Reproductive Age: A Cross-Sectional Observational Study

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A B S T R A C T

Objectives: To evaluate the prevalence and severity of depression, anxiety, perceived stress, and self-esteem impairment in women with PCOS compared to non-PCOS controls, and to examine the moderating roles of area of residence, physical symptom burden, lifestyle risk factors, and coping strategies on psychological outcomes.

Design: Cross-sectional observational study conducted over three months (July–September 2025).

Interventions: Administration of four validated psychometric instruments: PHQ-9 (depression), GAD-7 (anxiety), PSS-10 (perceived stress), and Rosenberg Self-Esteem Scale (RSES).

Main Outcome Measures: PHQ-9, GAD-7, PSS-10, and RSES scores categorised by validated severity cut-offs; Composite Vulnerability Index risk tier; physical symptom burden score.

Results: Of 300 participants (155 PCOS, 145 non-PCOS; mean age 25.66 ± 3.99 years), 94.8% of PCOS women had clinically significant depression (PHQ-9 ≥10) versus 34.5% of controls; mean PHQ-9 15.89 ± 3.97 versus 6.59 ± 7.24. Clinically significant anxiety affected 86.5% of PCOS versus 31.7% of non-PCOS women (mean GAD-7 12.83 versus 5.43). Low self-esteem was present in 65.8% of PCOS versus 11.7% of controls. Rural PCOS women had the highest mean depression scores (16.36 ± 2.96). Family history of PCOS (80.6% PCOS prevalence), short sleep (≤5 hrs: 89.8%), and high junk food consumption (3–5x/week: 85.6%) were strongly associated with PCOS.

Conclusion: PCOS imposes a profound, multi-dimensional psychological burden encompassing depression, anxiety, stress, and low self-esteem, further exacerbated by rural residence and adverse lifestyle factors. Integrated, PCOS-specific mental health screening and psychosocial intervention are urgently required in clinical practice.

Keywords: Polycystic Ovary Syndrome; Depression; Anxiety; Self-Esteem; PHQ-9; GAD-7; PSS-10; Mental Health; India; Lifestyle Risk Factors

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INTRODUCTION

Polycystic Ovary Syndrome (PCOS), first described by Stein and Leventhal in 1935, is one of the most prevalent endocrine disorders affecting women of reproductive age globally. It is a multifaceted condition responsible for approximately 80% of cases of anovulatory infertility, characterised by menstrual irregularities, hyperandrogenism, and polycystic ovarian morphology (1). In 2012, the World Health Organization estimated that 116 million women (3.4%) were affected worldwide, with an age-standardised incidence of 82.44 per 100,000 in the reproductive age

group in 2017, representing a 1.45% increase from 2007. The condition accounts for 0.43 million disability-adjusted life years (DALYs), and the majority of cases are diagnosed between the ages of 20 and 30 (1).

In India, the reported prevalence of PCOS varies considerably, ranging from 3.7% to 22.5% depending on the diagnostic criteria and study methodology. Region-specific estimates include 8.1% in Chennai, 8.2% in Bhopal, 13.54% in Ahmedabad, and 21% among medical students in Mumbai (4,5). PCOS is increasingly recognised as an emergent public health concern in India, given its concurrent physical, metabolic, and psychological morbidity (6).

Beyond reproductive and metabolic dimensions, PCOS is strongly and consistently associated with adverse psychological sequelae. The incidence of anxiety and depression in women with PCOS is three to four times higher than in the general population (1,2,7). Depression, anxiety, body image disturbances, and reduced self-esteem are well-documented in this population. The visible manifestations of PCOS — including hirsutism, acne, alopecia, and weight gain — profoundly affect self-perception, leading to feelings of inadequacy, social withdrawal, and impaired quality of life (1,8,9). These psychological consequences are frequently underdiagnosed and undertreated, particularly in resource-limited and rural Indian settings (13,14).

Self-esteem constitutes a fundamental component of psychological wellbeing. High self-esteem operates as a protective factor in managing chronic illness, while low self-esteem is linked to anxiety, depression, and increased reporting of physical symptoms (10,15). In PCOS, distress arising from visible symptoms directly undermines self-perception, contributing to a cycle of psychological morbidity that may be self-reinforcing and clinically under-recognised (8). Parmeshwari and Mehta (2025) demonstrated that social support and self-esteem together modulate the depression-anxiety relationship in PCOS women, underscoring the importance of psychosocial factors in this condition (10).

The pathophysiological mechanisms underlying the elevated psychological burden in PCOS remain incompletely characterised but are thought to involve a convergence of androgen excess, insulin resistance, obesity, hypothalamic-pituitary-adrenal (HPA) axis dysregulation, and neuroinflammation (7,11). Gul, Akkus, and Akkus (2025) identified adult separation anxiety and uncertainty intolerance as specific psychological constructs elevated in PCOS beyond hormonal effects (11). Talukder et al. (2025) documented a significant urban-rural disparity in psychological distress in PCOS, which this study also addresses in an Indian context (12).

Despite the growing global evidence base, large-scale, population-specific data from tier-2 Indian cities integrating lifestyle, clinical, and multi-domain psychological assessments remain limited. The present study was designed to address these gaps at a tertiary referral centre in Karimnagar, Telangana, serving both urban and rural populations.

OBJECTIVES

The objectives of this study were:

- To compare the prevalence and severity of depression (PHQ-9), anxiety (GAD-7), perceived stress (PSS-10), and self-esteem (RSES) between women with confirmed PCOS and non-PCOS controls.
- To examine the interaction between area of residence (urban/rural) and PCOS status on psychological outcomes using two-way between-subjects ANOVA.
- To evaluate the association between lifestyle risk factors (family history, exercise frequency, sleep duration, sitting duration, junk food consumption) and PCOS status.
- To assess the dose-response relationship between physical symptom burden (acne, hirsutism, alopecia) and mental health outcomes in PCOS.
- To characterise the differential effectiveness of coping strategies on anxiety outcomes by PCOS status.
- To construct and internally validate a Composite Vulnerability Index (CVI) for early mental health risk stratification in PCOS.

MATERIALS & METHODS

Study Design and Setting

This cross-sectional observational study was conducted at the Department of Obstetrics and Gynaecology, Chalmeda Anand Rao Institute of Medical Sciences (CAIMS), Karimnagar, Telangana, in collaboration with the Department of Psychiatry, from July to September 2025 (three months). CAIMS functions as a tertiary referral centre for Karimnagar district and surrounding areas. Ethical clearance was obtained from the Institutional Ethics Committee (IEC) prior to commencement, and written informed consent was obtained from all participants.

An important methodological consideration is that women attending this tertiary setting are more likely to have complex or severe presentations than those identified through community-based screening. Accordingly, the PCOS cases in this study are more precisely characterised as clinic-based PCOS patients with high symptom severity. Findings should not be directly extrapolated to mildly symptomatic or community-identified PCOS populations without independent replication.

Study Population

Women aged 16–38 years attending the outpatient gynaecological clinic were enrolled in two groups:

- Cases (PCOS Group): Women with a formally confirmed PCOS diagnosis, established by a qualified gynaecologist using the Rotterdam consensus criteria (at least two of three: oligo/anovulation, clinical or biochemical hyperandrogenism, polycystic ovarian morphology on ultrasound). A total of 155 women were enrolled.
- Controls (Non-PCOS Group): Age-matched women attending the same clinic for reasons unrelated to PCOS or

endocrine dysfunction, without a current or historical PCOS diagnosis. A total of 145 women were enrolled.

Inclusion criteria: Female, aged 16–38 years; provision of written informed consent.

Exclusion criteria: (i) History of diagnosed psychiatric disorder or ongoing mental health treatment; (ii) Other chronic endocrine conditions including diabetes mellitus, thyroid disorders, or congenital adrenal hyperplasia; (iii) Use of medications known to alter hormonal profile or mood (antidepressants, antipsychotics, long-term corticosteroids). Exclusion of women with prior psychiatric diagnoses was necessary to isolate PCOS-specific psychological effects; however, this conservatively biases estimates against detecting PCOS-associated morbidity, meaning true burden in unselected clinical populations is likely higher than reported here.

Sample Size

A total of 300 participants were enrolled (155 PCOS, 145 non-PCOS). Sample size was computed based on an anticipated difference in mean depression scores between groups, with an alpha level of 0.05 and power of 80%, informed by prior Indian studies (9, 13).

Instruments

Patient Health Questionnaire-9 (PHQ-9): Nine-item self-report scale for depression over the preceding two weeks; scored 0–27. Cut-offs: Minimal (0–4), Mild (5–9), Moderate (10–14), Moderately Severe (15–19), Severe (20–27); clinical threshold ≥10 (17).

Generalised Anxiety Disorder-7 (GAD-7): Seven-item anxiety scale; scored 0–21. Cut-offs: Normal (0–4), Mild (5–9), Moderate (10–14), Severe (15–21); clinical threshold ≥10 (18).

Perceived Stress Scale-10 (PSS-10): Ten-item scale assessing perceived stress; scored 0–40 after reverse-scoring items 4, 5, 7, and 8. Cut-offs: Low (0–13), Moderate (14–26), High (27–40) (16).

Rosenberg Self-Esteem Scale (RSES): Ten-item global self-esteem scale; scored 0–30 after reverse-scoring five negatively worded items. Score <15 indicates low self-esteem (15).

Composite Vulnerability Index (CVI)

An exploratory CVI was constructed to stratify mental health risk from five components: PCOS diagnosis (Yes=2; No=0), sleep duration (<6 hrs=2; 6–8 hrs=1; >8 hrs=0), junk food frequency (Daily/Multiple=2; 3–5x/week=1; Less=0), exercise frequency (Never=2; Rarely=1; Regular=0), and coping method (Avoidance/Emotional Eating=2; Neutral/Socialising=1; Exercise/Mindfulness=0). Total: 0–10; Low Risk=0–3; Moderate Risk=4–6; High Risk=7–10. Internal validation was performed by splitting the sample into derivation (n=150) and validation (n=150) sub-samples; sensitivity and specificity for detecting PHQ-9 ≥10 were calculated in both sub-samples. The CVI is an exploratory construct requiring external prospective validation before clinical recommendation.

Physical Symptom Burden Score

Severity of three cardinal PCOS symptoms (acne/oily skin, hirsutism, alopecia) was rated as None=0, Mild=1, Moderate=2, Severe = 3 for each, yielding a total score of 0–9. Categories: Low Burden (0–2), Moderate Burden (3–5), High Burden (6–9).

Statistical Analysis

Descriptive statistics were reported as frequencies, percentages, means, and standard deviations. Independent-samples t-tests compared continuous variables between groups; chi-square tests compared categorical variables. A two-way between-subjects ANOVA examined interaction effects between area of residence and PCOS status on PHQ-9, GAD-7, and RSES. A Kruskal-Wallis test assessed differences in psychological outcomes across physical symptom burden tiers within the PCOS group. Significance level: $p < 0.05$.

RESULTS

Sociodemographic Characteristics

Three hundred participants were enrolled (PCOS: n=155; Non-PCOS: n=145). Mean age was 25.66 ± 3.99 years (range 16–38). Table 1 presents key sociodemographic characteristics.

Table 1: Sociodemographic Characteristics of Participants (N=300)

Characteristic	PCOS (n=155)	Non-PCOS (n=145)	Total (N=300)
Age, mean ± SD (years)	~25.4 ± 3.9	~25.9 ± 4.1	25.66 ± 3.99
Unmarried	83 (53.5%)	85 (58.6%)	168 (56.0%)
Married	72 (46.5%)	60 (41.4%)	132 (44.0%)
Student	71 (45.8%)	44 (30.3%)	115 (38.3%)
Homemaker	60 (38.7%)	64 (44.1%)	124 (41.3%)
Working Professional	24 (15.5%)	37 (25.5%)	61 (20.3%)
Urban Residence	102 (65.8%)	90 (62.1%)	192 (64.0%)
Rural Residence	53 (34.2%)	55 (37.9%)	108 (36.0%)
Irregular Menstrual Cycles	155 (100%)	1 (0.7%)	156 (52.0%)
Positive Family History of PCOS	87 (56.1%)	21 (14.5%)	108 (36.0%)

Lifestyle and Clinical Risk Factors by PCOS Status

Table 2 presents the distribution of five key risk factors — family history, exercise frequency, sleep duration, sitting duration, and junk food consumption — across PCOS and non-PCOS groups.

Table 2: Lifestyle and Clinical Risk Factors by PCOS Status (N=300)

Factor	Category	Total (n)	With PCOS n (%)	Without PCOS n (%)
Family History	Positive (Yes)	108	87 (80.6%)	21 (19.4%)
	Not Sure	50	24 (48.0%)	26 (52.0%)
	Negative (No)	142	44 (31.0%)	98 (69.0%)
Exercise Frequency	Never/Almost Never	98	68 (69.4%)	30 (30.6%)
	Rarely (≤1x/week)	82	53 (64.6%)	29 (35.4%)
	Few times/week (2-4x)	65	26 (40.0%)	39 (60.0%)
	Daily (5-7x/week)	55	8 (14.5%)	47 (85.5%)
Sleep Duration	≤5 hours	98	88 (89.8%)	10 (10.2%)
	6 hours	70	41 (58.6%)	29 (41.4%)
	7 hours	58	17 (29.3%)	41 (70.7%)
	8 hours	58	7 (12.1%)	51 (87.9%)
	9+ hours	16	2 (12.5%)	14 (87.5%)
Sitting Duration	1-3 hrs/day	64	8 (12.5%)	56 (87.5%)
	4-6 hrs/day	114	71 (62.3%)	43 (37.7%)
	7-9 hrs/day	92	65 (70.7%)	27 (29.3%)
	10+ hrs/day	22	8 (36.4%)	14 (63.6%)
Junk Food Consumption	Rarely (<1x/week)	84	14 (16.7%)	70 (83.3%)
	1-2 times/week	103	49 (47.6%)	54 (52.4%)
	3-5 times/week	90	77 (85.6%)	13 (14.4%)
	Daily	23	15 (65.2%)	8 (34.8%)

PHQ-9 Depression Severity Distribution

Table 3 presents the distribution of PHQ-9 depression severity categories by PCOS status.

Table 3: PHQ-9 Depression Severity Distribution by PCOS Status

PHQ-9 Category	Score Range	PCOS (n=155) n (%)	Non-PCOS (n=145) n (%)	Total (N=300) n (%)
Minimal	0-4	3 (1.9%)	73 (50.3%)	76 (25.3%)
Mild	5-9	5 (3.2%)	22 (15.2%)	27 (9.0%)
Moderate	10-14	35 (22.6%)	20 (13.8%)	55 (18.3%)
Moderately Severe	15-19	98 (63.2%)	24 (16.6%)	122 (40.7%)
Severe	20-27	14 (9.0%)	6 (4.1%)	20 (6.7%)
Clinically Significant (≥10)	10-27	147 (94.8%)	50 (34.5%)	197 (65.7%)
Mean Score (± SD)	—	15.89 ± 3.97	6.59 ± 7.24	11.38 ± 7.34

GAD-7 Anxiety Severity Distribution

Table 4 presents the distribution of GAD-7 anxiety severity categories by PCOS status.

Table 4: GAD-7 Anxiety Severity Distribution by PCOS Status

GAD-7 Category	Score Range	PCOS (n=155) n (%)	Non-PCOS (n=145) n (%)	Total (N=300) n (%)
Normal	0-4	3 (1.9%)	79 (54.5%)	82 (27.3%)
Mild	5-9	18 (11.6%)	20 (13.8%)	38 (12.7%)
Moderate	10-14	92 (59.4%)	34 (23.4%)	126 (42.0%)
Severe	15-21	42 (27.1%)	12 (8.3%)	54 (18.0%)
Clinically Significant (≥10)	10-21	134 (86.5%)	46 (31.7%)	180 (60.0%)
Mean Score (± SD)	—	12.83 ± 3.31	5.43 ± 6.15	9.27 ± 6.27

PSS-10 Perceived Stress Distribution

Table 5 presents the distribution of PSS-10 perceived stress categories by PCOS status.

Table 5: PSS-10 Perceived Stress Distribution by PCOS Status

PSS-10 Category	Score Range	PCOS (n=155) n (%)	Non-PCOS (n=145) n (%)	Total (N=300) n (%)
Low Stress	0-13	2 (1.3%)	2 (1.4%)	4 (1.3%)
Moderate Stress	14-26	148 (95.5%)	136 (93.8%)	284 (94.7%)
High Stress	27-40	5 (3.2%)	7 (4.8%)	12 (4.0%)
Mean Score (± SD)	—	20.68 ± 3.39	18.21 ± 4.11	19.47 ± 3.92

Rosenberg Self-Esteem Scale (RSES) Distribution

Table 6 presents the distribution of RSES self-esteem categories by PCOS status.

Table 6: RSES Self-Esteem Category Distribution by PCOS Status

RSES Category	Score Range	PCOS (n=155) n (%)	Non-PCOS (n=145) n (%)	Total (N=300) n (%)
Low Self-Esteem	0-14	102 (65.8%)	17 (11.7%)	119 (39.7%)
Normal Self-Esteem	15-25	50 (32.3%)	118 (81.4%)	168 (56.0%)
High Self-Esteem	26-30	3 (1.9%)	10 (6.9%)	13 (4.3%)
Mean Score (± SD)	—	11.95 ± 4.69	19.02 ± 4.56	15.34 ± 5.61

Urban-Rural Interaction Effects on Mental Health (Two-Way ANOVA)

A two-way between-subjects ANOVA revealed significant interaction effects between area of residence and PCOS diagnosis. Table 7 presents descriptive statistics for the four sub-groups.

Table 7: Mean Mental Health Scores by PCOS Status and Area of Residence

Group	N	PHQ-9 Mean (SD)	GAD-7 Mean (SD)	RSES Mean (SD)
Rural Non-PCOS	55	3.82 (6.14)	3.35 (5.14)	20.16 (2.89)
Rural PCOS	53	16.36 (2.96)	13.15 (2.14)	10.72 (3.93)
Urban Non-PCOS	90	8.28 (7.36)	6.70 (6.39)	18.32 (5.22)
Urban PCOS	102	15.65 (4.40)	12.66 (3.77)	12.59 (4.93)
Interaction F (1,296)	—	F=14.72, p<0.001	F=11.23, p<0.001	—

Physical Symptom Burden and Mental Health

Table 8 presents the dose-response relationship between physical symptom burden and psychological outcomes within each group.

Table 8: Mental Health Outcomes by Physical Symptom Burden and PCOS Status

PCOS Status	Burden Category	N	PHQ-9 Mean (SD)	RSES Mean (SD)
PCOS	Low Burden (0-2)	9	11.67 (5.20)	16.78 (4.94)
PCOS	Moderate Burden (3-5)	50	15.34 (3.83)	13.88 (5.03)
PCOS	High Burden (6-9)	96	16.57 (3.66)	10.49 (3.77)
Non-PCOS	Low Burden (0-2)	113	5.18 (6.62)	19.63 (4.04)
Non-PCOS	Moderate Burden (3-5)	27	11.59 (6.53)	17.15 (5.19)
Non-PCOS	High Burden (6-9)	5	11.40 (11.30)	15.40 (8.02)

Note: Kruskal-Wallis test (PCOS group): Self-esteem H=23.52, p<0.0001; Depression H=14.47, p<0.001.

Composite Vulnerability Index

Table 9 presents the distribution of CVI risk categories and their associated mean psychological scores.

Table 9: Composite Vulnerability Index – Distribution and Mean Scores by Risk Group

Risk Group	N	Mean PHQ-9	Mean GAD-7	Mean PSS-10	Mean RSES
Low Risk (0-3)	103	4.65	3.91	17.41	19.80
Moderate Risk (4-6)	103	13.34	10.99	20.60	14.58
High Risk (7-10)	94	16.65	13.19	20.54	11.37
High vs. Low Δ	—	+12.00	+9.28	+3.13	-8.43

Note: Split-sample internal validation: Sensitivity 74-78%; Specificity 79-81% for detecting PHQ-9 ≥10. CVI is an exploratory construct; external validation required.

Coping Strategy Effectiveness by PCOS Status

Table 10 presents mean GAD-7 scores and clinical anxiety prevalence by coping strategy, stratified by PCOS status.

Table 10: Coping Method Effectiveness by PCOS Status (Mean GAD-7 Scores)

Coping Category	PCOS Mean GAD-7	PCOS % GAD-7 ≥10	Non-PCOS Mean GAD-7	Non-PCOS % GAD-7 ≥10
Social/Support	12.31	80.6%	5.23	30.0%
Distraction	12.33	81.5%	6.84	40.0%
Active/Mindful	12.86	95.5%	2.98	17.3%
Maladaptive	13.24	89.6%	7.78	44.4%

DISCUSSION

This cross-sectional observational study enrolled 300 women aged 16–38 years (mean 25.66 ± 3.99) at a tertiary care institution in Telangana, India, and provides comprehensive data on the multi-dimensional psychological burden of PCOS. The findings corroborate and extend the existing Indian and global literature across six domains: depression, anxiety, perceived stress, self-esteem, lifestyle risk factors, and urban-rural disparities.

Depression (PHQ-9)

A striking 94.8% of PCOS women in this cohort had clinically significant depression (PHQ-9 ≥10), with 63.2% in the Moderately Severe range and 9.0% in the Severe

range. The mean PHQ-9 of 15.89 ± 3.97 in the PCOS group was more than double the Non-PCOS mean (6.59 ± 7.24). These figures exceed those reported by Habib et al. (2021), who documented elevated PHQ-9 scores in North Indian PCOS women (13), and Kriti, Kumari, and Joshi (2025) in a case-control design (9), likely because the present sample is clinic-based with high symptom severity. The pathophysiological underpinnings are likely multifactorial: androgen-driven disruption of serotonergic and dopaminergic pathways, chronic symptom burden, body image disturbances, and the cumulative stress of managing a stigmatised condition (1,7). The prevalence of clinical depression exceeded 88% across all physical symptom burden tiers, indicating that PCOS per se, rather than visible symptom severity alone, is a fundamental risk factor for depression.

Anxiety (GAD-7)

Anxiety scores showed an even sharper contrast: 86.5% of PCOS women had clinically significant anxiety (GAD-7 ≥10) versus 31.7% of non-PCOS women, with a mean GAD-7 of 12.83 versus 5.43. The narrow standard deviation in the PCOS group (3.31 versus 6.15) demonstrates that anxiety in this cohort is not broadly distributed but tightly clustered in the moderate-to-severe range, suggesting near-universal anxiety burden among tertiary clinic-attending PCOS patients. Gul, Akkus, and Akkus (2025) identified specific anxiety constructs — adult separation anxiety and uncertainty intolerance — as significant contributors to GAD scores in PCOS beyond hormonal factors, consistent with the high aggregate scores observed here (11). Kadiri, Uma, and Lakshmi (2025) similarly documented psychological wellbeing impairment in PCOS (3). The sustained neuroinflammatory drive from androgen excess and insulin resistance, which disrupts serotonergic signalling, is likely central to this near-universal anxiety presentation (7).

Perceived Stress (PSS-10)

Both groups were heavily concentrated in the Moderate Stress category (PCOS 95.5%; Non-PCOS 93.8%), reflecting the shared stressor of attending a tertiary care clinic. However, the PCOS group mean of 20.68 ± 3.39 was significantly higher than the Non-PCOS mean of 18.21 ± 4.11, a 2.47-point difference representing an independent PCOS-specific stress burden above the shared clinical background. The paradoxically higher High Stress prevalence in Non-PCOS women (4.8% versus 3.2%) reflects the broader heterogeneity of non-PCOS clinical stressors and should not be over-interpreted. Yang et al. (2025) proposed that chronic perceived stress mediates the pathway between hormonal dysregulation and anxiety/depression outcomes in PCOS, consistent with the pattern observed in this study (7).

Self-Esteem (RSES)

The self-esteem findings are among the most clinically striking: 65.8% of PCOS women had low self-esteem (RSES <15) versus only 11.7% of Non-PCOS women — a more than five-fold difference. The mean RSES of 11.95 ± 4.69 in PCOS women falls within the low self-esteem range, compared to 19.02 ± 4.56 in Non-PCOS women, a 7.07-point gap of substantial clinical magnitude. Joshi, Sawant, and Mayadeo (2022) identified low self-esteem and body image concerns as core psychological sequelae of PCOS (1), and Pal and Mahapatra (2024) documented the same in an Indian sample (8), consistent with the present data. The dose-response analysis in Table 8 further demonstrates that self-esteem declines steeply with increasing physical symptom burden in PCOS (RSES: 16.78 at low burden to 10.49 at high burden; Kruskal-Wallis H=23.52, p<0.0001), identifying a “Visible Burden Threshold” at the moderate-to-high transition. Since low self-esteem is itself a risk factor for depression, anxiety, and reduced treatment engagement, Parmeshwari and Mehta (2025) demonstrate it functions as a psychological multiplier of the depression-anxiety burden (10), making it a primary target for psychosocial intervention.

Lifestyle Risk Factors

Family history of PCOS was the strongest single predictor of PCOS status: 80.6% of women with a positive family history also had PCOS, compared to 31.0% among those without — a 2.6-fold difference, consistent with established PCOS heritability and corroborated by Sharma et al. (2025) in a Delhi NCR cohort (4). Exercise frequency demonstrated a near-five-fold gradient in PCOS prevalence (69.4% among never-exercisers versus 14.5% among daily exercisers), consistent with the documented association between physical inactivity, insulin resistance, and androgen excess in PCOS (5). Sleep duration showed one of the most dramatic gradients: 89.8% PCOS prevalence among women sleeping ≤5 hours versus 12.1% among those sleeping 8 hours, consistent with chronic sleep deprivation's effects on cortisol, glucose metabolism, and hypothalamic-pituitary axis function. Junk food consumption showed a dose-response pattern (16.7% PCOS among rare consumers versus 85.6% at 3–5x/week), reflecting the role of high glycaemic load and ultra-processed food in exacerbating hyperinsulinaemia and androgen excess. These five lifestyle factors collectively suggest that PCOS in this cohort is embedded within a cluster of mutually reinforcing behavioural risks, each of which may independently and synergistically amplify both hormonal and psychological morbidity.

Urban-Rural Disparities

The two-way ANOVA revealed highly significant interaction effects (PHQ-9: F=14.72, p<0.001; GAD-7: F=11.23, p<0.001). The PCOS gap in depression was 12.54 points in rural settings versus 7.37 points in urban settings. Rural PCOS women had the highest mean PHQ-9 (16.36 ± 2.96) and the lowest self-esteem (RSES 10.72) of any sub-group. This pattern is consistent with Talukder et al. (2025) in Bangladesh (12) and broader evidence that rural residence compounds psychological morbidity in chronic conditions through limited access to specialist care, heightened social stigma, lower health literacy, and restricted peer support. In the Indian context, the absence of mental health services in primary care settings and restrictive social norms further amplify this disparity (2,14).

Coping Strategies and Biological Pathways

Active/Mindful coping was paradoxically associated with the highest mean GAD-7 in the PCOS group (12.86, clinical prevalence 95.5%) while being the most protective in the non-PCOS group (2.98, 17.3%). Two methodological caveats are essential: first, causal direction cannot be inferred from cross-sectional data; women with the most severe anxiety may disproportionately attempt active/mindful coping as a response to distress. Second, biologically, androgen-driven neuroinflammation (elevated IL-6 and TNF-α) and blunted HPA axis reactivity in PCOS may prevent the cortisol-mediated physiological stress relief that normally follows exercise or mindfulness, rendering these interventions insufficient as standalone strategies (7,11). Women also face PCOS-specific exercise barriers including body image distress, exercise intolerance, and perceived failure when expected weight loss does not occur. Social/Support coping produced the lowest PCOS group mean GAD-7 (12.31), consistent with Parmeshwari and Mehta (2025) who identified social support as a significant moderator of the depression-anxiety relationship in PCOS (10). These findings collectively argue for integrated biopsychosocial treatment models in which hormonal management is provided alongside relational and community-based support.

Composite Vulnerability Index

The CVI identified 94 women (31.3% of the sample) in the high-risk category, with mean PHQ-9 of 16.65, GAD-7 of 13.19, and RSES of 11.37, all within severe psychological morbidity ranges. The split-sample internal validation yielded sensitivity of 74–78% and specificity of 79–81% for detecting PHQ-9 ≥10, providing preliminary evidence of discriminative performance. As an exploratory construct with clinically-reasoned rather than empirically-derived item weights, external validation in independent prospective cohorts, including ROC curve optimisation and cut-off re-calibration, is required before clinical adoption.

Limitations

The cross-sectional design precludes causal inference. Recruitment from a tertiary referral hospital introduces positive selection bias; the cases are clinic-based patients with high symptom severity and findings should not be extrapolated to community-identified PCOS populations. The exclusion of women with prior psychiatric diagnoses conservatively biases estimates against detecting PCOS-specific morbidity, meaning the true psychological burden in unselected clinical populations is likely higher than reported. Self-report instruments are subject to response bias. The study was conducted at a single centre in Telangana and may not be generalisable to all Indian regions.

CONCLUSION

This cross-sectional observational study of 300 women at a tertiary care hospital in Karimnagar, Telangana, demonstrates that PCOS is associated with a profound, multi-dimensional psychological burden. Clinically significant depression affected 94.8% of PCOS women (mean PHQ-9 15.89), clinically significant anxiety affected 86.5% (mean GAD-7 12.83), and low self-esteem was present in 65.8% — figures that are substantially higher than in non-PCOS controls across all measures. Rural PCOS women bore the greatest burden, with mean PHQ-9 of 16.36, indicating that access and social factors compound the intrinsic psychological risk of the condition. Adverse lifestyle factors including short sleep, physical inactivity, sedentary behaviour, and high junk food consumption were strongly and consistently associated with PCOS in a dose-response manner. Physical symptom burden (hirsutism, acne, alopecia) showed a dose-response relationship with self-esteem decline, and the exploratory Composite Vulnerability Index identified approximately one-third of the total sample in a high-risk psychological category.

These findings carry direct clinical implications. First, routine, systematic psychometric screening using PHQ-9, GAD-7, and RSES should be embedded as standard practice in all PCOS outpatient consultations, not offered selectively. Second, given the limitations of Active/Mindful coping as a standalone strategy in PCOS and the relative protective value of Social/Support coping, integrated biopsychosocial treatment models incorporating community-based support, peer networks, and family engagement should complement pharmacological management. Third, rural PCOS patients require particular attention, with targeted outreach, referral pathways to mental health services, and community-level psychoeducation to address the disproportionate burden observed in this sub-group. Fourth, psychosocial interventions specifically targeting self-esteem and body image — such as cognitive-behavioural therapy and acceptance and commitment therapy — should be positioned as core rather than adjunctive components of PCOS care.

Future research should include prospective longitudinal studies to establish causal temporal relationships, multi-centre designs across diverse Indian regions and socioeconomic strata, formal external validation of the CVI in community-based cohorts, and investigation of the biological mechanisms by which PCOS attenuates the efficacy of active/mindful coping strategies.

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CONFLICTS OF INTEREST

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