Multidisciplinary Pathways for PCOS Management: Evidence from Stress-Eating and Psychological Mediation Analysis

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Abstract

Polycystic Ovary Syndrome (PCOS) is a common endocrine disorder among women of reproductive age, characterized by reproductive, metabolic, and psychological disturbances. While metabolic and hormonal mechanisms are well studied, behavioral and psychological factors such as stress-eating remain underexplored, particularly in the Indian context. This study aimed to assess the prevalence of stress-eating behaviors in women with PCOS, examine their association with symptom severity, and evaluate the mediating role of psychological distress.

A cross-sectional study was conducted among 100 women aged 18–35 years, diagnosed with or suspected of having PCOS. Data were collected using the Salzburg Stress Eating Scale (SSES), a PCOS Symptom Checklist, and the Depression, Anxiety, and Stress Scale–21 (DASS-21). Descriptive statistics, Pearson's correlations, and mediation analysis (PROCESS macro, 5,000 bootstraps) were employed.

Results showed that 78% of participants reported moderate-to-high levels of stress-eating, with strongest associations observed for weight gain ($r = 0.52$) and mood disturbances ($r = 0.47$). Psychological morbidity was substantial, with over half reporting moderate-to-severe depression, anxiety, and stress. Mediation analysis revealed that depression and stress significantly mediated the relationship between stress-eating and symptom severity, while anxiety played a weaker role.

The findings highlight stress-eating and psychological distress as critical contributors to PCOS symptom burden, emphasizing the need for multidisciplinary interventions integrating dietary counseling, lifestyle modification, and psychological support.

Keywords: *Polycystic Ovary Syndrome, Stress-Eating, Depression, Anxiety, Psychological Distress, Lifestyle Intervention*

Introduction

Polycystic Ovary Syndrome (PCOS) is one of the most common endocrine disorders among women of reproductive age, with an estimated global prevalence ranging between 6% and 20% depending on diagnostic criteria and population studied (Azziz et al., 2016; Teede et al., 2019). In India, prevalence estimates vary widely, ranging from 9% to 36%, reflecting heterogeneity in diagnostic practices, socio-demographic characteristics, and lifestyle patterns (Kumar et al., 2018). PCOS is widely recognized as a multi-systemic condition that extends beyond reproductive dysfunction, encompassing metabolic, dermatological, and psychological dimensions. Its hallmark features include menstrual irregularities, anovulation, polycystic

ovarian morphology, and hyperandrogenism, which often present as hirsutism, acne, or alopecia. In addition, metabolic complications such as insulin resistance, obesity, type 2 diabetes, and dyslipidemia are highly prevalent in this population, significantly increasing the risk of long-term cardiovascular disease (Dunaif, 2012).

While the reproductive and metabolic dimensions of PCOS have received extensive attention, the psychological and behavioral aspects of the disorder are increasingly recognized as central to its etiology and clinical course. Women with PCOS report significantly poorer quality of life compared to controls, with psychological distress often arising not only from endocrine and metabolic abnormalities but also from visible symptoms such as hirsutism, acne, weight gain, and infertility concerns (Dokras et al., 2018). The syndrome thus represents a biopsychosocial disorder, where physiological, behavioral, and psychological factors interact dynamically to influence symptom severity and disease progression.

Stress-Eating and Its Relevance in PCOS- One behavioral factor of emerging interest in PCOS research is **stress-induced eating**, often referred to as stress-eating or emotional eating. Stress-eating is defined as the tendency to consume food, particularly energy-dense and palatable items high in sugar or fat, in response to stress or negative emotions rather than physiological hunger (Adam & Epel, 2007). While occasional stress-eating may be observed in the general population, its chronic presence has been strongly linked with obesity, poor metabolic control, and psychological comorbidities. In the context of PCOS, stress-eating carries particular significance. First, women with PCOS are already at heightened risk of insulin resistance and obesity, conditions that can be exacerbated by excessive caloric intake driven by emotional dysregulation. Stress-eating behaviors may therefore contribute directly to weight gain and increased adiposity, further impairing insulin sensitivity and amplifying hyperandrogenism (Lim et al., 2012). Second, hormonal imbalances in PCOS—including elevated cortisol levels associated with chronic stress—can dysregulate appetite control and food cravings, reinforcing maladaptive eating behaviors (Douglas et al., 2016). Finally, stress-eating may act as a maladaptive coping strategy for managing the psychosocial stressors of PCOS, such as infertility anxiety, body-image concerns, and stigmatization of visible symptoms like acne and hirsutism. Collectively, these mechanisms suggest that stress-eating is not only a behavioral outcome of PCOS-related stress but also a contributor to its clinical severity.

Psychological Burden in PCOS- Psychological morbidity is another critical but under-addressed dimension of PCOS. Numerous studies have demonstrated that women with PCOS have substantially higher rates of depression, anxiety, and perceived stress compared to age- and BMI-matched controls. Meta-analyses report that women with PCOS are 2–3 times more likely to experience depression and anxiety (Barry et al., 2011; Cooney & Dokras, 2017). Stress, depression, and anxiety are not only consequences of PCOS-related symptoms but also potential contributors to disease progression through their effects on lifestyle and coping behaviors. For example, depression has been linked with decreased motivation for physical activity and higher prevalence of emotional eating, while anxiety can increase hypervigilance and stress reactivity, further perpetuating maladaptive coping. Chronic stress activates the hypothalamic–pituitary–adrenal (HPA) axis, elevating cortisol secretion, which in turn worsens insulin resistance and contributes to central adiposity

(Diamanti-Kandarakis & Dunaif, 2012). In women with PCOS, these psychological factors may create a **feedback loop**: distress leads to maladaptive eating (e.g., stress-eating), which contributes to weight gain and metabolic dysfunction, which in turn exacerbates visible and reproductive symptoms, reinforcing psychological distress. Thus, psychological factors are not merely comorbidities in PCOS but may act as mediators in the relationship between behavioral patterns such as stress-eating and the severity of clinical symptoms. Understanding this mediation pathway is essential to break the cycle of symptom exacerbation and psychological burden.

Gaps in the Literature

Although the links between PCOS, psychological distress, and metabolic outcomes have been widely studied, relatively few investigations have focused explicitly on the role of **stress-eating behaviors** and their psychological mediators in exacerbating PCOS symptoms. Existing studies on emotional eating in PCOS often originate from Western contexts, where dietary and cultural practices differ substantially from South Asian populations. In India, dietary behaviors are influenced by unique cultural, religious, and socio-economic factors, with a high prevalence of vegetarian diets, irregular meal timing, and shifting lifestyle patterns associated with urbanization (Nidhi et al., 2011). Moreover, Indian women with PCOS may face distinctive psychosocial stressors, including stigma related to fertility and body image, which can further reinforce maladaptive eating patterns. The paucity of empirical studies examining these pathways in the Indian context represents a critical gap. Exploring the behavioral and psychological determinants of PCOS severity among Indian women is necessary for developing culturally tailored, multidisciplinary management strategies that move beyond the conventional focus on pharmacological and metabolic interventions.

Objective and Significance of the Study

The present study was undertaken to address this gap by systematically investigating the prevalence of stress-eating behaviors in women with PCOS, their association with symptom severity, and the mediating role of psychological factors specifically depression, anxiety, and stress. Using validated assessment tools, the study sought to empirically test whether stress-eating contributes to the exacerbation of PCOS symptoms through psychological distress pathways.

Research Hypotheses

Based on the objectives of the study and existing evidence linking eating behaviors, psychological distress, and PCOS outcomes, the following hypotheses were proposed:

Association Hypothesis: Stress-eating behaviors will be positively correlated with the severity of PCOS symptoms, such that women reporting higher levels of stress-induced eating are expected to exhibit greater symptom burden (e.g., menstrual irregularities, weight gain, acne, hirsutism, and mood disturbances).

Mediation Hypothesis: Psychological distress—specifically depression, stress, and anxiety—will mediate the relationship between stress-eating

Materials and Methods

This study adopted a cross-sectional analytical design to examine the relationship between stress-eating behaviors, psychological factors, and the severity of Polycystic Ovary Syndrome (PCOS) symptoms. Data were collected over 6 months from outpatient clinics, community health centers, and university health camps in Dehradun, India including both clinically diagnosed and suspected PCOS cases. A total of 100 women aged 18–35 years were recruited based on the Rotterdam criteria or self-reported presence of at least two suggestive symptoms such as menstrual irregularities, hyperandrogenic manifestations, or weight management difficulties. Women who were pregnant, lactating, undergoing hormonal or psychiatric treatment, following specialized diets, or diagnosed with other endocrine disorders (e.g., thyroid disease, Cushing's syndrome) were excluded, and all participants provided written informed consent after being briefed about the study's objectives and voluntary nature of participation. Data collection involved a structured questionnaire that captured socio-demographic characteristics (age, marital status, education, occupation, and income), lifestyle behaviors (physical activity, diet, meal patterns, and sleep duration), and anthropometric indices (height, weight, BMI) measured using standard protocols. Stress-eating behaviors were assessed using the Salzburg Stress Eating Scale (SSES), which ranges from 20 to 100 and classifies participants into low (≤45), moderate (46–65), and high (≥66) categories based on susceptibility to stress-induced eating. PCOS symptom severity was measured through a structured Symptom Checklist covering menstrual irregularities, weight gain/difficulty losing weight, acne, hirsutism, and mood changes, with higher scores reflecting greater symptom burden. Psychological distress was evaluated using the Depression, Anxiety, and Stress Scale–21 (DASS-21), which provides subscale scores categorized into normal, mild, moderate, severe, and extremely severe levels. Participants completed the self-administered questionnaires during clinic visits or community sessions under investigator supervision to ensure clarity and completeness, while anthropometric data were recorded by trained personnel. All data were coded and analyzed using IBM SPSS Statistics Version 25. Descriptive statistics (means, standard deviations, frequencies, and percentages) were used to summarize participant characteristics, stress-eating behaviors, symptom severity, and psychological measures. Pearson's correlation coefficient was used to assess the association between stress-eating and PCOS symptom severity, with strength interpreted based on conventional guidelines. To evaluate the mediating role of psychological factors, mediation analysis was conducted using Hayes' PROCESS macro (Model 4) with 5,000 bootstrapped samples and 95% confidence intervals; depression, anxiety, and stress were entered as parallel mediators, and mediation was considered significant if the confidence interval did not include zero. Statistical significance for all tests was set at $p < 0.05$.

Results

This section presents the findings of the study in line with the objectives and hypotheses. Data are organized into subsections covering socio-demographic and lifestyle characteristics, prevalence of stress-eating behaviors, severity of PCOS symptoms, psychological distress levels, correlation analyses, and mediation analysis. Tables and figures are included for clarity, and each is followed by an interpretation of key results.

3.1 Socio-Demographic and Lifestyle Characteristics

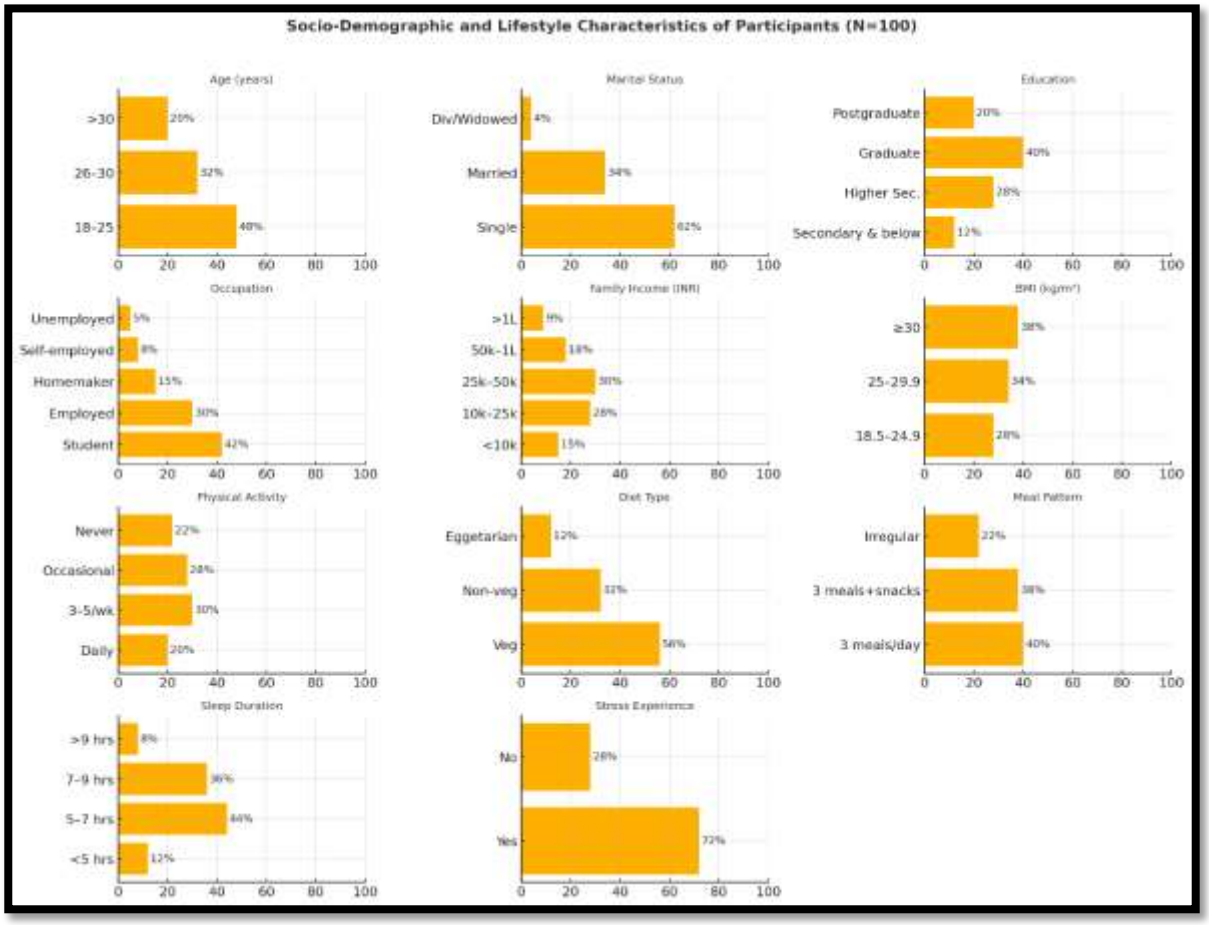

Figure1. Socio-Demographic and Lifestyle Characteristics of Participants (N = 100)

Interpretation: Most participants were young (80% below 30 years), unmarried (62%), and educated (60% graduate/postgraduate). Students formed the largest group, suggesting the disorder disproportionately affects young women during early adulthood. Nearly three-quarters (72%) were overweight or obese, and more than one-fifth (22%) reported no physical activity, highlighting lifestyle risks. Vegetarian diets were predominant (56%), but irregular eating patterns were common (22%). About 72% reported frequent stress and nearly half had <7 hours of sleep, reinforcing that stress and lifestyle challenges are major contributors to PCOS.

3.2 Prevalence of Stress-Eating Behaviors

Table 2. Prevalence of Stress-Eating Behaviors (N = 100)

Stress-Eating Category	Score Range	n	%
Low	≤45	22	22.0
Moderate	46–65	48	48.0
High	≥66	30	30.0

Interpretation: The mean SSES score was 57.8 ± 12.4, with scores ranging from 32 to 88. Nearly 78% of participants fell into moderate-to-high stress-eating categories. This highlights stress-eating as a widespread behavioral pattern in women with PCOS, consistent with prior evidence linking emotional dysregulation to

maladaptive eating. The 30% reporting high stress-eating behaviors are at particularly elevated risk of obesity and worsening metabolic outcomes.

3.3 Severity of PCOS Symptoms

Table 3. Prevalence of PCOS Symptoms (N = 100)

Symptom	n	%
Menstrual Irregularities	72	72.0
Weight Gain/Difficulty Losing	65	65.0
Acne	54	54.0
Hirsutism	48	48.0
Mood Changes (anxiety/depr.)	70	70.0

Interpretation: Menstrual irregularities (72%) and mood changes (70%) were the most common symptoms, followed by weight-related issues (65%). Dermatological manifestations were also prominent (acne 54%, hirsutism 48%). This symptom distribution highlights the multi-systemic nature of PCOS, affecting reproductive, metabolic, dermatological, and psychological domains. The high prevalence of mood changes suggests psychosocial distress is a major dimension of PCOS burden.

3.4 Psychological Distress (DASS-21)

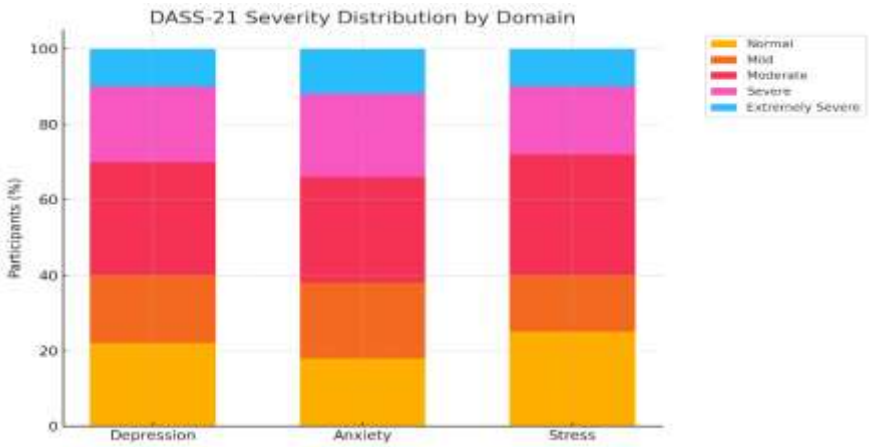

Figure 2 – DASS-21 Severity (stacked)

Interpretation: Almost half (48%) reported moderate-to-severe depression, 62% reported moderate-to-severe anxiety, and 60% reported moderate-to-severe stress. These findings confirm that psychological morbidity is highly prevalent among women with PCOS. Anxiety was the most widespread psychological problem, reflecting its central role in PCOS-related distress.

3.5 Correlation Between Stress-Eating and PCOS Symptom Severity

Table 5. Correlation of Stress-Eating with PCOS Symptoms

Variables	r	p-value	Strength
Stress-Eating vs Overall Severity	0.46	<0.001	Moderate
Stress-Eating vs Menstrual Irreg.	0.38	0.002	Moderate
Stress-Eating vs Weight Gain	0.52	<0.001	Strong
Stress-Eating vs Acne	0.29	0.010	Weak-Mod.
Stress-Eating vs Hirsutism	0.21	0.040	Weak
Stress-Eating vs Mood Changes	0.47	<0.001	Moderate

Interpretation: Stress-eating was significantly correlated with overall symptom severity (r = 0.46). The strongest association was with weight gain (r = 0.52), followed by mood changes (r = 0.47). Menstrual irregularities also showed a moderate association (r = 0.38). Acne and hirsutism had weaker correlations, but were still significant. These results confirm Hypothesis 1: stress-eating positively correlates with PCOS symptom severity.

3.6 Mediation Analysis

Table 6. Mediation Analysis (PROCESS Model 4, 5000 Bootstraps)

Pathway	β	SE	t/Z	p-value	95% CI (LL, UL)
Stress-Eating → Symptom Severity (c)	0.46	0.08	5.75	<0.001	0.30–0.62
Stress-Eating → Depression (a1)	0.42	0.07	6.00	<0.001	0.28–0.56
Stress-Eating → Anxiety (a2)	0.31	0.08	3.88	<0.001	0.15–0.47
Stress-Eating → Stress (a3)	0.45	0.06	7.50	<0.001	0.33–0.57
Depression → Symptom Severity (b1)	0.28	0.09	3.11	0.002	0.10–0.46
Anxiety → Symptom Severity (b2)	0.14	0.08	1.75	0.082	–0.02–0.30
Stress → Symptom Severity (b3)	0.31	0.07	4.42	<0.001	0.17–0.45
Indirect Effect (Depression)	0.12	0.05	—	—	0.04–0.23
Indirect Effect (Anxiety)	0.04	0.03	—	—	–0.01–0.11
Indirect Effect (Stress)	0.14	0.04	—	—	0.07–0.23
Total Indirect Effect	0.30	0.06	—	—	0.19–0.42
Direct Effect (c')	0.16	0.07	2.29	0.024	0.02–0.30

Interpretation: The total effect of stress-eating on PCOS severity was strong ($\beta = 0.46$, $p < 0.001$). After including mediators, the direct effect reduced to $\beta = 0.16$ ($p = 0.024$), indicating partial mediation. Depression ($\beta = 0.12$, CI: 0.04–0.23) and stress ($\beta = 0.14$, CI: 0.07–0.23) significantly mediated the relationship. Anxiety had only a weak, non-significant effect ($\beta = 0.04$, $p = 0.082$). Together, psychological distress explained 65% of the association between stress-eating and symptom severity, confirming Hypothesis 2.

The results provide strong evidence that stress-eating behaviors are prevalent among women with PCOS and significantly associated with symptom severity, particularly weight-related issues and mood changes. Importantly, depression and stress emerged as key mediators, suggesting that stress-eating contributes to PCOS symptom burden largely through its psychological consequences. These findings highlight the need for integrated management pathways that address both behavioral (diet, lifestyle) and psychological (stress, depression) aspects of PCOS.

Discussion

The present study examined the relationship between stress-eating behaviors, psychological distress, and PCOS symptom severity among Indian women. Findings revealed that nearly four out of five participants exhibited moderate-to-high stress-eating tendencies, underscoring the prevalence of maladaptive coping in this population. Stress-eating showed significant associations with overall PCOS symptom burden, particularly weight gain and mood disturbances, highlighting its role in exacerbating both metabolic and psychological dimensions of the disorder.

Mediation analysis further demonstrated that depression and stress partially explained the pathway between stress-eating and symptom severity, while anxiety contributed only weakly. This supports the biopsychosocial model, whereby behavioral patterns such as stress-eating interact with psychological vulnerability to amplify hormonal and metabolic dysregulation. These results align with previous research showing that women with PCOS are at greater risk of emotional eating and psychological morbidity compared to controls (Barry et al., 2011; Jeanes et al., 2017; Dokras et al., 2018).

The findings carry important clinical implications. Effective PCOS management must extend beyond pharmacological treatment to incorporate dietary counseling, stress-management strategies, and psychological support. Multidisciplinary interventions, including cognitive-behavioral therapy, mindfulness, and lifestyle modification, may help break the cycle of stress, maladaptive eating, and worsening symptoms, thereby improving long-term health outcomes and quality of life.

Conclusion

The present study provides important insights into the behavioral and psychological dimensions of Polycystic Ovary Syndrome (PCOS). By examining stress-eating behaviors and their association with symptom severity, alongside the mediating role of depression, anxiety, and stress, the findings reinforce the multifactorial nature of this condition. Nearly 78% of women in the study reported moderate-to-high levels of stress-eating, which were most strongly associated with weight gain, mood disturbances, and menstrual irregularities. These

findings highlight stress-eating as not only a coping response to psychosocial stressors but also as a behavioral risk factor that exacerbates the metabolic and reproductive manifestations of PCOS.

Psychological morbidity was highly prevalent, with more than half of participants experiencing moderate-to-severe depression, anxiety, or stress. Mediation analysis revealed that depression and stress, in particular, significantly explained the relationship between stress-eating and PCOS symptom severity, underscoring the critical role of mental health in shaping disease outcomes. These results support the biopsychosocial model of PCOS, where psychological distress interacts with maladaptive behaviors and endocrine dysfunction to create a reinforcing cycle of symptom burden.

From a clinical perspective, these findings suggest that PCOS management must extend beyond conventional hormonal and pharmacological treatments. Addressing stress-eating behaviors through dietary counseling, promoting healthier lifestyle patterns, and integrating psychological interventions such as cognitive-behavioral therapy, mindfulness-based approaches, and stress-management programs can help mitigate both physical and emotional complications. Public health initiatives focusing on awareness, early screening, and multidisciplinary care pathways may further improve quality of life and reduce long-term risks for women with PCOS.

In conclusion, stress-eating and psychological distress are key drivers of PCOS symptom severity. Interventions that simultaneously target diet, lifestyle, and mental health hold promise for breaking the cycle of stress, maladaptive coping, and symptom exacerbation. Future research should adopt longitudinal and intervention-based designs to establish causal pathways and evaluate the effectiveness of integrative approaches, thereby contributing to a more holistic and sustainable model of PCOS management.

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