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Research Article

Association of Lifestyle Factors with Anxiety and Depression in Women with Polycystic Ovary Syndrome: A Prospective Observational Study

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ABSTRACT

Background: Polycystic Ovary Syndrome (PCOS) is a common endocrine disorder associated with metabolic, reproductive, and psychological complications. This study aimed to evaluate the association of lifestyle factors with anxiety and depression among women with PCOS. **Objectives:** A prospective observational study was conducted among 207 females aged 10-40 years diagnosed with PCOS based on the Rotterdam criteria. **Materials and Methods:** Demographic, clinical, and lifestyle-related data were collected using a structured proforma, and psychological assessment was performed using the Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) scales. **Results:** The majority of participants were aged 21-30 years (55.07%), with most having normal body mass index (56.03%), followed by overweight (23.1%). Menstrual irregularities were observed in all participants, while acne and hirsutism were present in 66.66% and 75.83% of participants, respectively. Anxiety symptoms were reported in 87.9% of participants, and depression in 85.48%, predominantly of mild to moderate severity. A significant association was observed between occupation and lifestyle factors, including junk food consumption, soft drink intake, and physical inactivity ($p<0.05$). Occupational categories were also significantly associated with the severity of anxiety and depression ($p<0.05$). **Conclusion:** The study highlights a high prevalence of psychological morbidity among women with PCOS and emphasizes the role of modifiable lifestyle factors. Early screening and integrated management strategies addressing both physical and psychological aspects are essential to improve overall outcomes in this population.

Keywords: Anxiety, Body mass index, Depression, Lifestyle factors, Menstrual irregularities, Physical inactivity, Polycystic ovary syndrome, Psychological morbidity.

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INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is a common endocrine and metabolic disorder affecting women of reproductive age, Characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology. It is estimated to affect approximately 3-10% of women globally, with reported prevalence in India ranging from 8.2% to 22.5%, depending on diagnostic criteria and population characteristics (World Health Organization, 2022; Mishra *et al*., 2023). PCOS is associated with a wide spectrum of clinical manifestations, including menstrual irregularities, infertility, obesity, insulin resistance, and metabolic disturbances, contributing significantly to long-term health risks.

The etiology of PCOS is multifactorial, involving genetic predisposition, hormonal imbalance, insulin resistance, and environmental influences. Among these, lifestyle-related factors such as poor dietary habits, physical inactivity, and obesity play a critical role in the development and progression of the syndrome (Patil *et al*., 2023; Begum *et al*., 2017). Rapid urbanization, sedentary behavior, and increased consumption of energy-dense foods have further amplified the burden of PCOS, particularly among young women and students in developing countries like India.

Beyond physical and metabolic abnormalities, PCOS has a substantial psychological impact. Women with PCOS are at increased risk of mental health disorders, particularly anxiety and depression, due to a combination of hormonal imbalances, metabolic dysfunction, and visible clinical features such as acne,

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hirsutism, and obesity (Hasan *et al.*, 2022; Greenwood *et al.*, 2024). These psychological disturbances can significantly impair quality of life, social functioning, and treatment adherence. Despite this, mental health assessment is often overlooked in routine clinical management of PCOS.

In the Indian context, there is limited region-specific data evaluating the combined impact of lifestyle factors and psychological morbidity among women with PCOS, especially in semi-urban and rural populations. Most existing studies have focused either on metabolic risk factors or on psychological outcomes independently, with insufficient emphasis on their interrelationship (Jabeen *et al.*, 2022; Sasikala *et al.*, 2021). Furthermore, awareness regarding PCOS and its psychological implications remains low, leading to delayed diagnosis and inadequate management.

Therefore, the present study aims to assess the association of lifestyle factors with anxiety and depression among women with PCOS, providing insights into the integrated burden of physical and psychological health in this population.

METHODOLOGY

Study Design and Setting

A prospective observational study was conducted to evaluate the association of lifestyle factors with anxiety and depression among women diagnosed with Polycystic Ovary Syndrome (PCOS). The study was carried out at the outpatient gynecology department of Mamata General Hospital, Khammam, along with selected fertility centers in Telangana, India, over a period of [insert study duration].

Study Population and Sample Size

A total of 207 female participants aged between 10 and 40 years, diagnosed with PCOS, were included in the study. The diagnosis of PCOS was established based on the Rotterdam criteria, which require the presence of at least two of the following three features: oligo- or anovulation, clinical or biochemical hyperandrogenism, and polycystic ovarian morphology confirmed by ultrasound examination.

Inclusion and Exclusion Criteria

Women aged 10-40 years who were diagnosed with PCOS according to the Rotterdam criteria and were willing to provide written informed consent were included in the study. Participants with other endocrine disorders such as thyroid or adrenal abnormalities, pregnant or lactating women, and individuals with pre-existing psychiatric disorders or those receiving psychotropic medications were excluded to avoid confounding effects.

Data Collection Procedure

Participants were recruited using a convenience sampling method from the outpatient departments. After obtaining written informed consent, data were collected using a structured data collection form. Demographic and clinical variables including age, Body Mass Index (BMI), marital status, occupation, menstrual history, and family history of PCOS were recorded. In addition, lifestyle-related factors such as dietary habits, including consumption of junk food and sugar-sweetened beverages, and physical activity levels were assessed based on patient self-report.

Assessment of Clinical and Lifestyle Parameters

Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m^2) and categorized according to the World Health Organization (WHO) classification. Lifestyle factors such as dietary patterns and physical activity were evaluated to determine their association with PCOS and psychological outcomes. Clinical manifestations related to PCOS, including menstrual irregularities and features of hyperandrogenism, were also documented.

Psychological and Dermatological Assessment

Psychological assessment was performed using validated standardized tools. Depression was evaluated using the Patient Health Questionnaire-9 (PHQ-9), and anxiety was assessed using the Generalized Anxiety Disorder-7 (GAD-7) scale. Scores of ≥10 on both scales were considered indicative of moderate to severe symptoms. Hyperandrogenic features were assessed using the Ferriman-Gallwey scoring system for hirsutism, while acne severity was evaluated using the Global Acne Grading System (GAGS).

Diagnostic Evaluation

Ultrasound examination and relevant hormonal assessments were performed to confirm the diagnosis of PCOS in accordance with the Rotterdam criteria.

Outcome Measures

The primary outcomes of the study were the prevalence and severity of anxiety and depression among women with PCOS. Secondary outcomes included the association of lifestyle factors such as BMI, dietary habits, and physical activity with psychological outcomes, as well as the relationship between clinical features such as hirsutism and acne with anxiety and depression.

Statistical Analysis

Data were entered and analyzed using GraphPad Prism version 11. Descriptive statistics were used to summarize demographic and clinical characteristics, and categorical variables were expressed

as frequencies and percentages. Associations between categorical variables were analyzed using the appropriate statistical tests.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of Anurag Pharmacy College. Written informed consent was obtained from all participants prior to inclusion in the study. Confidentiality and anonymity of the participants were strictly maintained throughout the study.

RESULTS

A total of 207 participants were included in the study. The majority of participants (55.07%) were aged between 21-30 years. Most participants had normal BMI (56.03%), followed by overweight (23.1%). A higher proportion of participants were unmarried (70.53%) and students (58.93%). Family history of PCOS was reported in 9.66% of participants (Table 1).

A total of 207 participants were included in the study. The majority of participants (55.07%) belonged to the 21-30 years age group, followed by 32.36% in the 10-20 years group and 12.56% in the 31-40 years group. With respect to Body Mass Index (BMI), most participants had normal BMI (56.03%), while 23.1% were overweight and 4.34% were classified as obese. Additionally, 16.4% of participants were underweight.

Regarding marital status, a higher proportion of participants were unmarried (70.53%) compared to married individuals (29.46%). In terms of occupation, students constituted the largest group (58.93%), followed by individuals categorized under others (15.94%) and household workers (14.97%). IT professionals accounted for 7.24% of the study population, while unemployed individuals and doctors represented 2.41% and 0.48%, respectively.

Family history of PCOS was reported in 9.66% of participants, whereas the majority (90.33%) had no known family history of the condition (Table 1).

Menstrual irregularities were observed in all participants, with the majority (81.64%) reporting cycle intervals of 2-4 months. Acne was present in 66.66% of participants, predominantly mild in severity (65.7%). Hirsutism was observed in 75.83% of participants, with mild presentation being the most common (48.30%) (Table 2).

Anxiety symptoms were observed in 87.90% of participants, with mild anxiety being the most common (34.29%), followed by moderate (25.12%), minimal (22.70%), and severe anxiety (5.79%). Depression was reported in 85.48% of participants, with mild depression accounting for 28.98% of cases, followed by minimal (22.70%), moderate (20.28%), and severe depression (13.52%). A small proportion of participants did not exhibit symptoms of anxiety or depression (Table 3).

A significant association was observed between occupation and lifestyle risk factors, including junk food consumption, soft drink intake, and physical inactivity ($p<0.05$). However, no significant association was found between occupation and family history of PCOS ($p>0.05$) data presented in (Table 4).

A statistically significant association was observed between occupation and severity of anxiety and depression among women with PCOS ($p<0.05$). Mild anxiety was the most common presentation among students and IT professionals, while moderate to severe anxiety was more prevalent among individuals in the "others" category. Similarly, depression severity varied across occupational groups, with higher proportions of moderate to severe depression observed among household and "others" categories (Table 5).

DISCUSSION

The present study evaluated the association of lifestyle factors with anxiety and depression among women with Polycystic Ovary Syndrome (PCOS), highlighting the combined burden of metabolic, reproductive, and psychological disturbances in this population. The findings demonstrate a high prevalence of psychological morbidity along with significant associations between lifestyle behaviors and mental health outcomes, particularly among younger and student populations.

The demographic profile of the study population (Table 1) revealed that the majority of participants were aged between 21-30 years, consistent with the known epidemiology of PCOS, which predominantly affects women in their reproductive years. Similar age distributions have been reported in previous Indian studies, where early adulthood represents the peak period for diagnosis due to increased health-seeking behavior and symptom recognition (Mishra *et al.*, 2023). A higher proportion of participants were unmarried and students, reflecting the socio-demographic shift toward early detection in younger populations. Although most participants had a normal BMI, a substantial proportion were overweight or obese, supporting existing evidence that even women with normal BMI may exhibit metabolic disturbances in PCOS, particularly in Asian populations.

Clinical characteristics (Table 2) showed that menstrual irregularities were highly prevalent, with the majority experiencing cycle intervals of 2-4 months, indicating persistent ovulatory dysfunction. Dermatological manifestations such as acne and hirsutism were also common, reflecting underlying hyperandrogenism. These findings are consistent with previous reports highlighting that menstrual irregularities and hyperandrogenic features are key clinical indicators of PCOS and are often associated with increased metabolic and endocrine dysfunction (Begum *et al.*, 2017). The high prevalence of hirsutism and acne also has important psychological implications, as these visible symptoms are known to negatively impact body image and self-esteem.

A major finding of this study is the high prevalence of anxiety (87.9%) and depression (85.48%) among participants (Table 3), which is notably higher than general population estimates. Similar trends have been reported in studies by Hasan *et al.* (2022), where women with PCOS demonstrated significantly higher rates of psychological distress compared to controls. The predominance of mild to moderate severity suggests that psychological symptoms may often remain underdiagnosed and untreated. The interplay between hormonal imbalance, insulin resistance, and chronic inflammation in PCOS has been proposed as a contributing mechanism for increased susceptibility to mood disorders. Additionally, visible clinical features such as obesity, acne, and hirsutism may further exacerbate psychological distress through social stigma and reduced self-confidence.

The association between occupation and lifestyle risk factors (Table 4) highlights the significant role of behavioral and environmental influences in PCOS. High prevalence of junk food consumption, soft drink intake, and physical inactivity among students and IT professionals reflects modern lifestyle patterns characterized by sedentary behavior and poor dietary habits. These findings align with previous research indicating that lifestyle modifications, including dietary control and physical activity, play a crucial role in the management and prevention of PCOS (Patil *et al.*, 2023). The lack of association between family history and PCOS-related factors in this study further emphasizes the dominant role of

Table 1: Socio-demographic and Baseline Clinical Characteristics of Participants (*n*=207).

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	10-20	67	32.36
	21-30	114	55.07
	31-40	26	12.56
Body Mass Index (kg/m^2)	<18.5 (Underweight)	34	16.4
	18.5-24.9 (Normal)	116	56.03
	25-29.9 (Overweight)	48	23.1
	30-34.9 (Obese Class I)	7	3.38
	35-39.9 (Obese Class II)	2	0.96
Marital Status	Married	61	29.46
	Unmarried	146	70.53
Occupation	Students	122	58.93
	IT Professionals	15	7.24
	Household	31	14.97
	Unemployed	5	2.41
	Doctors	1	0.48
	Others	33	15.94
Family History of PCOS	Yes	20	9.66
	No	187	90.33

Table 2: Clinical and Reproductive Characteristics of Study Participants (*n*=207).

Variable	Category	Frequency (n)	Percentage (%)
Menstrual Irregularities	2-4 months	169	81.64
	4-8 months	33	15.94
	>8 months	5	2.41
Acne Severity (GAGS)	Mild	136	65.70
	Moderate	2	0.96
	Total with Acne	138	66.66
Hirsutism (Ferriman-Gallwey Score)	Mild	100	48.30
	Moderate	47	22.70
	Severe	10	4.83
	Total with Hirsutism	157	75.83

modifiable lifestyle factors over genetic predisposition in this population.

Importantly, the study also demonstrated a significant association between occupational categories and psychological outcomes (Table 5). Students and individuals in the "others" category exhibited higher proportions of moderate to severe anxiety and depression. This may be attributed to academic stress, irregular lifestyle patterns, and increased exposure to unhealthy dietary behaviors among students, as well as varying socio-economic and occupational stressors in other groups. These findings support the growing body of evidence suggesting that psychosocial stress and lifestyle factors are closely interlinked in PCOS and contribute to worsening mental health outcomes (Greenwood *et al.*, 2024).

The findings of this study have important clinical implications. The high prevalence of psychological morbidity underscores the need for routine mental health screening in women with PCOS, particularly in younger populations. Integrating psychological assessment tools such as PHQ-9 and GAD-7 into routine clinical practice can facilitate early identification and management of anxiety and depression. Furthermore, lifestyle interventions targeting diet, physical activity, and stress management should be emphasized as part of a comprehensive management strategy for PCOS.

However, the study has certain limitations. The use of convenience sampling and recruitment from specific clinical settings may limit the generalizability of the findings. The relatively small sample

Table 3: Distribution of Anxiety and Depression among Study Participants (*n*=207).

Variable	Category	Frequency (n)	Percentage (%)
Anxiety (GAD-7)	Minimal	47	22.70
	Mild	71	34.29
	Moderate	52	25.12
	Severe	12	5.79
	Total with Anxiety	182	87.90
Depression (PHQ-9)	Minimal	47	22.70
	Mild	60	28.98
	Moderate	42	20.28
	Severe	28	13.52
	Total with Depression	177	85.48

Table 4: Association of Occupation with Lifestyle Risk Factors (*n*=207).

Risk Factor	Students n (%)	IT n (%)	Household n (%)	Unemployed n (%)	Others n (%)	*p*-value
Family history	12 (9.8)	3 (20.0)	4 (12.9)	0 (0)	1 (2.9)	>0.05
Junk food	116 (95.1)	15 (100)	26 (83.9)	4 (80.0)	28 (82.4)	<0.05
Soft drinks	117 (95.9)	15 (100)	28 (90.3)	5 (100)	30 (88.2)	<0.05
Physical inactivity	99 (81.1)	10 (66.7)	20 (64.5)	5 (100)	21 (61.8)	<0.05

Others category includes doctors. Percentages are calculated column-wise within each occupational group, Table 5.

Table 5: Distribution of Anxiety and Depression According to Occupation among Women with PCOS (*n*=207).

Variable	Category	Students (*n*=122)	IT (*n*=15)	Household (*n*=31)	Unemployed (*n*=5)	Others* (*n*=34)	*p*-value
Anxiety (GAD-7)	Minimal	27 (22.1)	6 (40.0)	8 (25.8)	3 (60.0)	3 (8.8)	<0.05
	Mild	48 (39.3)	6 (40.0)	7 (22.6)	1 (20.0)	9 (26.5)	
	Moderate	27 (22.1)	3 (20.0)	8 (25.8)	0 (0)	14 (41.2)	
	Severe	7 (5.7)	0 (0)	1 (3.2)	0 (0)	4 (11.8)	
Depression (PHQ-9)	Minimal	28 (23.0)	4 (26.7)	6 (19.4)	2 (40.0)	7 (20.6)	<0.05
	Mild	38 (31.1)	3 (20.0)	9 (29.0)	1 (20.0)	10 (29.4)	
	Moderate	28 (23.0)	4 (26.7)	5 (16.1)	1 (20.0)	4 (11.8)	
	Severe	28 (23.0)	4 (26.7)	11 (35.5)	1 (20.0)	13 (38.2)	

Others category includes doctors. Percentages are calculated column-wise within each occupational group. Statistical significance was assessed using the Chi-square test. A *p*-value <0.05 was considered statistically significant.

size in certain occupational categories, such as unemployed individuals, may also affect the reliability of subgroup analyses. Additionally, the reliance on self-reported data for lifestyle factors may introduce reporting bias. Despite these limitations, the study provides valuable insights into the combined impact of lifestyle and psychological factors in PCOS within a semi-urban Indian population.

In conclusion, the present study highlights a high burden of anxiety and depression among women with PCOS and demonstrates a significant association between lifestyle factors and psychological outcomes. These findings emphasize the need for a multidisciplinary approach incorporating lifestyle modification and mental health evaluation to improve overall quality of life in women with PCOS.

CONCLUSION

The present study demonstrates a high prevalence of anxiety and depression among women with PCOS, indicating a substantial psychological burden associated with the condition. Lifestyle factors, particularly unhealthy dietary habits and physical inactivity, were significantly associated with both PCOS and psychological outcomes. Occupational patterns, especially among students and sedentary professions, further influenced these risk factors and mental health status.

These findings emphasize the importance of incorporating routine psychological screening and lifestyle assessment into the standard management of PCOS. Early identification and targeted interventions focusing on lifestyle modification, mental health support, and patient education are crucial to improving quality of life and long-term health outcomes. A multidisciplinary approach involving clinicians, pharmacists, and mental health professionals is recommended for comprehensive care in women with PCOS.

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ABBREVIATIONS

PCOS: Polycystic Ovary Syndrome; **BMI:** Body Mass Index; **PHQ-9:** Patient Health Questionnaire-9; **GAD-7:** Generalized Anxiety Disorder-7; **GAGS:** Global Acne Grading System; **WHO:** World Health Organization.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTIONS

Mani Santhosh Nikhil Soma conceptualized and designed the study, supervised the research, contributed to data interpretation, and critically revised the manuscript for important intellectual content. Jaya S contributed to study design, data acquisition, and manuscript preparation. Shiva Supraja P, Harini V, Nishitha G, and Joshna K were involved in data collection, literature search, and initial drafting of the manuscript. Chinnaeswaraiah Maram contributed to data analysis, statistical analysis, and manuscript editing. All authors reviewed and approved the final version of the manuscript.

SUMMARY

This prospective observational study evaluated the association of lifestyle factors with anxiety and depression among women with Polycystic Ovary Syndrome (PCOS). A total of 207 participants aged 10-40 years were assessed using standardized tools (PHQ-9 and GAD-7). The study demonstrated a high prevalence of anxiety (87.9%) and depression (85.48%) among participants. Lifestyle factors, including junk food consumption, soft drink intake, and physical inactivity, were significantly associated with PCOS and psychological outcomes. Occupational patterns, particularly among students and sedentary groups, showed a strong relationship with both lifestyle behaviors and mental health status. These findings highlight the importance of integrating lifestyle modification and mental health screening into routine PCOS management. A multidisciplinary approach is essential to improve overall quality of life and long-term health outcomes in affected women.

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