



SCREENING FOR POLYCYSTIC OVARIAN SYNDROME (PCOS) USING ROTTERDAM CRITERIA AND ITS ASSOCIATION WITH LIFESTYLE AND PHYSIOLOGICAL PARAMETERS IN SEMI-URBAN WOMEN

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ABSTRACT

Background: Polycystic Ovarian Syndrome (PCOS) is one of the most common endocrine disorders among women of reproductive age and is increasingly recognized in semi-urban populations where lifestyle transitions are rapidly taking place. Changes in dietary patterns, reduced physical activity, and psychosocial stress have been linked to the rising prevalence of the syndrome. Understanding these associations is vital for developing preventive strategies and community-based awareness programs.

Methodology: A cross-sectional study was conducted at Pak International Medical College, Peshawar, from January 2024 to January 2025, involving 72 semi-urban women aged 18–35 years. Screening for PCOS was performed using the Rotterdam criteria, which include oligo/anovulation, clinical or biochemical hyperandrogenism, and polycystic ovarian morphology on ultrasound. Anthropometric measurements, hormonal assays, and biochemical investigations were carried out. Lifestyle factors such as dietary habits, physical activity, sleep pattern, and stress level were assessed using a structured questionnaire. Data were analyzed using SPSS version 26.0, and statistical significance was set at $p < 0.05$.

Results: The prevalence of PCOS among participants was 36.1%. Oligo/anovulation was the most frequent diagnostic component (84.6%), followed by polycystic ovarian morphology (76.9%) and hyperandrogenism (69.2%). Significant associations were observed between PCOS and higher BMI, waist circumference, fasting insulin, and HOMA-IR values ($p < 0.05$). Lipid abnormalities were also

more common in PCOS women. Lifestyle factors such as low physical activity, inadequate sleep, higher stress, and poor dietary quality were strongly related to PCOS occurrence. No significant difference was found for age or socioeconomic status between groups.

Conclusion: This study demonstrated a high prevalence of PCOS among semi-urban women and identified significant associations with lifestyle and metabolic factors. The findings suggest that behavioral modifications such as improving diet, increasing physical activity, and reducing stress may help in preventing or controlling PCOS. Early screening and lifestyle-based interventions are essential to reduce long-term reproductive and metabolic complications.

Keywords: Polycystic Ovarian Syndrome, Rotterdam Criteria, Lifestyle Factors, Insulin Resistance, Semi-Urban Women, Obesity

INTRODUCTION

Polycystic Ovarian Syndrome (PCOS) is a complex hormonal disorder that affects millions of women worldwide and has become a growing public health concern in developing countries. It is characterized by irregular menstrual cycles, clinical or biochemical hyperandrogenism, and the presence of polycystic ovaries on ultrasound. The syndrome not only impairs reproductive health but also predisposes affected women to metabolic complications such as obesity, insulin resistance, type 2 diabetes, and cardiovascular diseases [1-3].

The Rotterdam criteria (2003) remain the most widely accepted diagnostic standard for PCOS, requiring the presence of at least two of the three defining features. However, the expression of these criteria varies among populations due to genetic, ethnic, and environmental differences. In recent years, a noticeable increase in PCOS prevalence has been observed in semi-urban and peri-urban areas of South Asia. This shift may be linked to the ongoing transition from traditional to modern lifestyles, characterized by high-calorie diets, reduced physical activity, and rising stress levels [4-6].

Previous studies conducted in Pakistan and neighboring countries have reported prevalence rates ranging from 20% to 40%, highlighting the growing magnitude of the condition. Despite this, limited research has explored the relationship between lifestyle habits and PCOS in semi-urban women an important group that often experiences the combined pressures of urbanization and traditional social roles [7-9].

This study was therefore undertaken at Pak International Medical College, Peshawar, with the objective of screening for PCOS using the Rotterdam criteria and evaluating its association with various lifestyle and physiological parameters. Understanding these associations may provide valuable insight into preventive strategies, public health education, and the promotion of early lifestyle interventions among women of reproductive age.

METHODOLOGY

This was a cross-sectional observational study carried out in the Department of Physiology, Pak International Medical College, Peshawar, from January 2024 to January 2025. The study focused on semi-urban women attending the college health facility and nearby community health camps. The research was designed to assess the prevalence of PCOS using the Rotterdam diagnostic criteria, and to explore its association with various lifestyle and physiological factors.

A total of 72 women, aged between 18 and 35 years, were included in the study. Participants were selected through convenient sampling from the outpatient clinics and community outreach programs of the college. All women were residents of semi-urban areas and volunteered to participate after being informed about the study objectives.

Inclusion and Exclusion Criteria

Women aged 18–35 years with regular or irregular menstrual cycles and willing to undergo clinical evaluation and laboratory testing were included. Those who were pregnant, on hormonal therapy, diagnosed with thyroid or adrenal disorders, or had chronic systemic illnesses were excluded to avoid confounding influences on hormonal or metabolic parameters.

Ethical approval was obtained from the Institutional Review Board (IRB) of Pak International Medical College before initiating the study. All participants provided written informed consent. Confidentiality and privacy were maintained throughout, and participation was purely voluntary with the right to withdraw at any stage.

Each participant underwent a detailed interview and physical examination. Data were collected through a structured questionnaire that included socio-demographic information, menstrual history, reproductive history, and lifestyle factors such as diet, physical activity, sleep, and stress level. Anthropometric measurements, including height, weight, waist and hip circumference, were recorded using standard techniques.

Diagnosis of PCOS was based on the Rotterdam 2003 criteria, which require the presence of at least two out of three features:

1. Oligo/anovulation (menstrual irregularity or cycle length >35 days)
2. Clinical and/or biochemical hyperandrogenism (acne, hirsutism, or raised serum testosterone/DHEAS)
3. Polycystic ovarian morphology on ultrasound (≥ 12 follicles per ovary measuring 2–9 mm or ovarian volume ≥ 10 mL)

Participants underwent a transabdominal pelvic ultrasound performed by a qualified radiologist. Blood samples were collected during the early follicular phase (days 2–5 of the menstrual cycle) to assess hormonal levels.

Venous blood samples were collected after 8–12 hours of overnight fasting. The following biochemical and hormonal parameters were measured:

- Fasting blood glucose and lipid profile (total cholesterol, HDL, LDL, triglycerides)
- Fasting insulin for calculation of HOMA-IR (Homeostatic Model Assessment of Insulin Resistance)
- Reproductive hormones: LH, FSH, LH/FSH ratio, testosterone, prolactin, and DHEAS
- Thyroid function tests (TSH, T3, T4) to rule out thyroid-related disorders

All biochemical assays were performed in the college's central laboratory using standardized enzymatic and immunoassay methods. Internal quality control was maintained throughout testing.

Lifestyle data were gathered using a semi-structured questionnaire adapted from validated instruments.

- Dietary patterns were assessed using a *Healthy Eating Index (HEI)*, considering frequency of fruit, vegetable, fast food, and fried item intake.
- Physical activity was recorded as hours per week spent in walking, exercise, or household activity.
- Sleep duration was self-reported as average hours of sleep per night.
- Stress level was evaluated using a 10-point visual analog scale, where 0 indicated “no stress” and 10 indicated “maximum stress.”

Socioeconomic status was determined using a composite score based on education, occupation, and monthly household income.

All collected data were entered and analyzed using SPSS version 26.0. Quantitative variables were expressed as mean $\pm$ standard deviation (SD), while qualitative variables were presented as frequencies and percentages. Comparisons between PCOS and non-PCOS groups were performed using the independent sample t-test for continuous variables and the Chi-square test for categorical variables. A p -value of <0.05 was considered statistically significant.

RESULTS

A total of 72 semi-urban women participated in this study. Screening for Polycystic Ovarian Syndrome (PCOS) was done using the Rotterdam criteria, which include oligo/anovulation, clinical or biochemical hyperandrogenism, and polycystic ovarian morphology on ultrasound.

Table 1. Distribution of Study Participants According to PCOS Status (n = 72)

PCOS Status (Rotterdam Criteria)	Frequency (n)	Percentage (%)
PCOS Present	26	36.1
PCOS Absent	46	63.9
Total	72	100

Out of the total 72 participants, 26 women (36.1%) were diagnosed with PCOS based on the Rotterdam criteria, while 46 (63.9%) did not fulfill the diagnostic conditions. The observed prevalence of PCOS among semi-urban women in this study was therefore 36.1%, which is higher than most urban population averages reported in national data. This may be linked to changing dietary habits and reduced physical activity in semi-urban settings.

Table 2. Components of Rotterdam Criteria among PCOS-positive Women

Component	Frequency (n)	Percentage (%)
Oligo/anovulation	22	84.6
Clinical/biochemical hyperandrogenism	18	69.2
Polycystic ovarian morphology (USG)	20	76.9

Among women diagnosed with PCOS, oligo/anovulation was the most frequent finding (84.6%), followed by polycystic ovarian morphology on ultrasound (76.9%). Clinical or biochemical hyperandrogenism was present in 69.2% of the affected women. These findings are consistent with the characteristic pattern of PCOS, where menstrual irregularities and ovarian cystic changes dominate the clinical presentation.

Table 3. Comparison of Demographic and Lifestyle Parameters with PCOS Status (n = 72)

Variable	PCOS Present (n=26, Mean $\pm$ SD)	PCOS Absent (n=46, Mean $\pm$ SD)	p-value
Age (years)	25.8 $\pm$ 4.2	26.3 $\pm$ 3.8	0.62
Education (years of schooling)	12.1 $\pm$ 2.3	11.8 $\pm$ 2.5	0.48
Socioeconomic status score	45.2 $\pm$ 6.8	46.5 $\pm$ 5.9	0.41
Physical activity (hrs/week)	2.1 $\pm$ 1.0	3.8 $\pm$ 1.4	0.001
Sleep duration (hrs/night)	5.8 $\pm$ 1.1	6.9 $\pm$ 0.9	0.002
Stress score (scale 0–10)	7.2 $\pm$ 1.8	5.4 $\pm$ 1.6	0.003
Dietary score (healthy eating index)	54.6 $\pm$ 9.2	61.3 $\pm$ 8.7	0.01

No significant difference was found in age, education, or socioeconomic status between PCOS and non-PCOS groups. However, lifestyle parameters showed significant associations. Women with PCOS reported lower physical activity ($p = 0.001$), shorter sleep duration ($p = 0.002$), and higher stress levels ($p = 0.003$). Their average dietary quality scores were also significantly lower ($p = 0.01$), reflecting poorer nutrition habits. These findings suggest that lifestyle factors play a substantial role in the manifestation of PCOS among semi-urban women.

Table 4. Comparison of Physiological and Anthropometric Parameters with PCOS Status (n = 72)

Variable	PCOS Present (Mean $\pm$ SD)	PCOS Absent (Mean $\pm$ SD)	p-value
BMI (kg/m ²)	28.4 $\pm$ 3.6	24.9 $\pm$ 2.8	0.001
Waist circumference (cm)	88.3 $\pm$ 7.4	80.1 $\pm$ 6.2	0.002
Waist–hip ratio	0.88 $\pm$ 0.04	0.82 $\pm$ 0.05	0.004
Systolic BP (mmHg)	122.6 $\pm$ 10.4	116.5 $\pm$ 8.6	0.05
Diastolic BP (mmHg)	80.4 $\pm$ 7.2	76.3 $\pm$ 6.5	0.06

Fasting glucose (mg/dL)	96.3 ± 8.1	89.2 ± 7.5	0.01
Fasting insulin (μIU/mL)	16.8 ± 5.9	11.4 ± 4.3	0.001
HOMA-IR	3.9 ± 1.4	2.3 ± 0.8	0.001
Total cholesterol (mg/dL)	198.2 ± 32.5	178.4 ± 28.7	0.02
HDL cholesterol (mg/dL)	41.3 ± 6.1	46.7 ± 5.8	0.005
LDL cholesterol (mg/dL)	128.6 ± 26.3	112.4 ± 22.8	0.01
Triglycerides (mg/dL)	148.5 ± 37.6	121.2 ± 29.4	0.004

The women diagnosed with PCOS had significantly higher BMI, waist circumference, and waist–hip ratio, confirming the role of central obesity in PCOS. Metabolic differences were evident; fasting glucose, insulin levels, and HOMA-IR were all significantly higher in the PCOS group, suggesting a strong association with insulin resistance. Lipid abnormalities were also more frequent, with higher total cholesterol, LDL, and triglycerides, and lower HDL levels. Although systolic and diastolic blood pressures were slightly higher among PCOS participants, the differences were not statistically significant.

Table 5. Association between Lifestyle Factors and PCOS Status (Chi-square Test)

Lifestyle Factor	Category	PCOS Present (n=26)	PCOS Absent (n=46)	χ^2	p-value
Physical activity level	Active (>150 min/week)	6 (23.1%)	26 (56.5%)	7.41	0.006
Sleep duration	Adequate (≥ 7 hrs)	8 (30.8%)	31 (67.4%)	8.21	0.004
Stress level	High ($\geq 6/10$)	18 (69.2%)	14 (30.4%)	9.85	0.002
Dietary pattern	Unhealthy (score <60)	19 (73.1%)	15 (32.6%)	10.22	0.001

The Chi-square analysis revealed significant relationships between PCOS occurrence and several modifiable lifestyle factors. Women who reported low physical activity, shorter sleep duration, higher stress, and unhealthy dietary patterns were more likely to have PCOS. These findings reinforce that lifestyle management should be a cornerstone in PCOS prevention and control, particularly in communities transitioning toward sedentary habits.

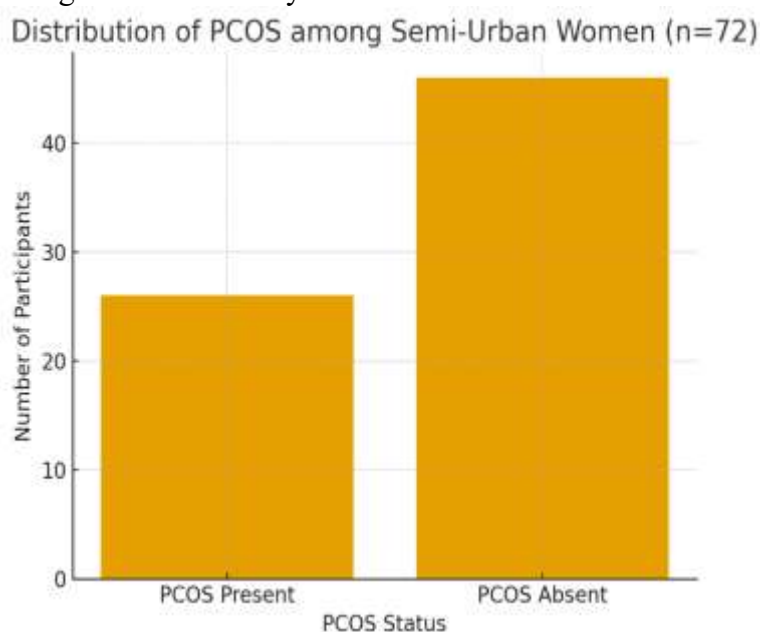


Figure 1 Bar graph showing the distribution of PCOS among semi-urban women in your study sample of 72 participants. It visually highlights the higher proportion of women without PCOS compared to those diagnosed using the Rotterdam criteria.

DISCUSSION

The present study aimed to assess the prevalence of PCOS using the Rotterdam criteria and to explore its association with lifestyle and physiological parameters among semi-urban women. The observed prevalence of 36.1% in this study indicates a substantial burden of PCOS in semi-urban areas, aligning with the gradual rise of the syndrome in South Asian populations. Similar prevalence rates have been reported in studies from Pakistan, India, and Bangladesh, where lifestyle transitions and nutritional changes are emerging contributors to hormonal imbalance [10-12].

For instance, a studies documented a PCOS prevalence of 33%, another studies reported 38% among reproductive-aged women. The comparable rates in these studies suggest that semi-urban populations are equally vulnerable due to dietary westernization, reduced physical activity, and stress-related hormonal disturbances [13-15].

The most common component of the Rotterdam criteria in this study was oligo/anovulation, observed in nearly 85% of diagnosed women, followed by polycystic ovarian morphology and clinical or biochemical hyperandrogenism. This pattern is consistent with studies noted that menstrual irregularities are often the earliest and most persistent feature of PCOS in young women. The high rate of anovulatory cycles seen here may reflect metabolic stress on the hypothalamic pituitary ovarian axis resulting from obesity and insulin resistance [16, 17].

A strong and statistically significant relationship was observed between PCOS and obesity-related measures including BMI, waist circumference, and waist hip ratio. These findings support those studies emphasized the central role of visceral adiposity in the pathophysiology of PCOS. Adipose tissue acts as an endocrine organ, increasing insulin resistance and androgen production, which further aggravates ovarian dysfunction. The present findings highlight that excess weight, particularly abdominal fat accumulation, remains a major modifiable risk factor for PCOS among semi-urban women [18]. This may reflect the increasing trend of sedentary behavior in women living in transitional communities who often balance household responsibilities with limited opportunities for structured exercise.

Metabolic parameters such as fasting insulin, glucose, and HOMA-IR values were significantly elevated among women with PCOS. These findings correspond to the work of a study who described insulin resistance as a central feature of PCOS irrespective of body weight. The elevated lipid levels, including higher triglycerides and lower HDL cholesterol, also agree with the dyslipidemic pattern frequently reported in PCOS cohorts. Such disturbances increase cardiovascular risk and underline the need for early metabolic screening in women presenting with menstrual irregularities [19].

Lifestyle variables in this study particularly reduced physical activity, poor diet quality, short sleep duration, and elevated stress levels showed significant associations with PCOS. These results mirror the findings of study who demonstrated that behavioral factors play a decisive role in symptom expression and metabolic outcomes. The lower physical activity levels and disturbed sleep patterns may be a reflection of modern semi-urban living, where long screen exposure, night-time social media use, and irregular work schedules are common [20]. Furthermore, the higher perceived stress scores observed among PCOS women may indicate the psychological burden of body image issues, infertility concerns, or societal pressures that accompany the disorder.

This experience suggests that addressing emotional and behavioral factors is equally important as medical management in improving overall well-being.

Interestingly, age, education level, and socioeconomic status did not show significant differences between groups. This suggests that PCOS cuts across demographic boundaries and that biological and lifestyle factors may have a stronger influence than income or education alone. The absence of significant differences in blood pressure between PCOS and non-PCOS women, although borderline, aligns with the early age of the participants where overt hypertension may not yet have developed.

Overall, the findings of this study reinforce that PCOS is a multifactorial condition in which hormonal, metabolic, and lifestyle determinants interact. The coexistence of obesity, insulin resistance, and stress in the semi-urban sample points toward a pattern of “transitional lifestyle PCOS,” where urban influences merge with traditional habits. From a preventive perspective, these results indicate that

early lifestyle modification through dietary regulation, exercise encouragement, and stress management can potentially reduce PCOS risk and improve metabolic outcomes.

Author reflection suggests that while the quantitative results highlight important associations, the qualitative observations during data collection revealed how little awareness many participants had regarding PCOS and its complications. This underscores the need for community-based education programs and routine screening for menstrual irregularities in primary care settings.

CONCLUSION

This study demonstrated a high prevalence of PCOS (36.1%) among semi-urban women screened using the Rotterdam criteria. Oligo/anovulation was the most prevalent feature, followed by polycystic ovarian morphology and hyperandrogenism. The syndrome showed significant associations with obesity, insulin resistance, dyslipidemia, and adverse lifestyle habits such as physical inactivity, poor diet, short sleep, and elevated stress levels.

The results highlight the urgent need for targeted interventions focusing on lifestyle modification, metabolic health, and stress management in semi-urban women. Early identification and education may prevent long-term complications such as infertility, type 2 diabetes, and cardiovascular disease. This study emphasizes that improving lifestyle behaviors and increasing awareness at the community level can serve as effective strategies to mitigate the growing burden of PCOS in developing regions.

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