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Frequency of Polycystic Ovarian Syndrome and Associated Hormonal Abnormalities in Obese Individuals: A Cross-Sectional Study

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ABSTRACT

Background: Polycystic ovarian syndrome (PCOS) is a prevalent endocrine-metabolic disorder that disproportionately affects obese women of reproductive age. Despite increasing global awareness, regional epidemiological data remain limited, particularly in South Asian populations. This study aimed to determine the frequency of PCOS and associated hormonal abnormalities among obese women in Peshawar, Pakistan. **Methods:** A cross-sectional study was conducted over six months at the Department of Medicine, Lady Reading Hospital. A total of 132 obese females aged 20–40 years were recruited using non-probability consecutive sampling. Diagnosis of PCOS was based on the Rotterdam criteria. Hormonal abnormalities such as chronic anovulation, hyperandrogenism, and polycystic ovarian morphology were assessed. Demographic and clinical characteristics were analyzed using SPSS version 22.0, with stratification and post-stratification tests applied to evaluate effect modifiers. **Results:** PCOS was diagnosed in 67.4% (n=89) of participants. Among these, chronic anovulation was present in 78.7%, hyperandrogenism in 70.8%, and polycystic ovarian morphology in 100%. PCOS was significantly more prevalent in women aged 26–35 years (p=0.016), married women (p=0.037), and urban residents (p=0.048). No significant associations were found with education or profession. **Conclusion:** The high frequency of PCOS and associated hormonal dysfunctions among obese women underscores the need for targeted screening and early intervention strategies in high-risk populations. Lifestyle modifications and multidisciplinary management approaches should be prioritized to mitigate long-term complications.

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is a complex, familial, polygenetic metabolic condition. [1] Polycystic ovary syndrome (PCOS) is the most common cause of anovulatory infertility affecting up to nearly 10% of reproductive-age women, and it was recently reported that there are up to ~1.55 million incident cases of women with PCOS globally. [2] In addition, women with PCOS are also at increased risk of developing long-term endocrine complications and cardiometabolic diseases. [2] The diagnosis of PCOS is currently based on the criteria of the Rotterdam consensus meeting, which broadened the previous NIH (National Institute of Health) classification. It is based on at least two of the following features: oligo-anovulation, hyperandrogenism, and polycystic ovaries by ultrasound. [3]

The exact etiology and pathogenesis of PCOS are still an area of active research, although multiple hypotheses have been postulated, ranging from genetic susceptibility to environmental exposure, both in utero and in the postnatal life. [4] studies have demonstrated global differences in PCOS phenotypes of women of different racial and ethnic groups. For example, Middle Eastern, Mediterranean, Indian, and South Asian women with PCOS have a higher prevalence and/or severity of hirsutism than the East Asian or Caucasian (Finnish, Norwegian, and United States [US] White) women. [5, 6] Additionally, there are global differences in the prevalence of adverse metabolic outcomes associated with PCOS in women of different racial and ethnic groups. In a recent systematic review, 30 studies evaluated and compared metabolic outcomes of women with PCOS of different ethnicities worldwide. [7] South Asian, Indian, and Norwegian women with PCOS in particular are at increased risk of developing metabolic syndrome (MetSyn), whereas Hispanic and Mexican women are at high risk of developing insulin resistance, and US Black women are at increased risk of hypertension compared with White women. [7] In a cross-sectional study of over 1000 women with PCOS in 5 countries, Chan et al. [6] found a significant difference in the prevalence of MetSyn, as well as the clustering of its components in different racial/ethnic groups.

In one study obese women were screened for PCOS and it was found that 67.6% had PCOS. Among PCOS women chronic anovulation was present in 71.3% women, hyperandrogenism was present in 50.5% and polycystic ovaries were present in 70.5% women. [8]

The rationale of this study is to determine frequency of polycystic ovarian syndrome and associated hormonal abnormalities in obese individuals in our local population. Literature review shows that there is racial difference in epidemiology of PCOS and associated hormonal abnormalities. Despite this known association, there is a need for more detailed epidemiological data on the frequency of PCOS in obese populations and the extent to which hormonal abnormalities are present. Understanding the prevalence of PCOS among obese individuals can provide valuable insights into the burden of the condition and help identify specific hormonal patterns that might be unique to this subgroup. This information is crucial for developing targeted interventions and management strategies for women with PCOS who are also struggling with obesity.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of Medicine, Lady Reading Hospital, Peshawar, a tertiary care public hospital that caters to a diverse patient population. The study duration was six months, extending from October 10, 2024, to April 10, 2025.

A non-probability consecutive sampling technique was employed to recruit participants attending the medical outpatient department during the study period. The minimum sample size was calculated using the WHO sample size calculator with a confidence level of 95%, an absolute precision of 8%, and an anticipated frequency of polycystic ovarian syndrome (PCOS) in obese females of 67.6% based on prior literature [8]. The calculated sample size was 132 patients.

Eligibility Criteria

Inclusion Criteria

- Females aged 20 to 40 years.
- Body mass index (BMI) greater than 25 kg/m^2.

Exclusion Criteria

- Pregnant females (ruled out through pelvic ultrasound and urine β-hCG testing).
- Women with documented endocrine disorders such as congenital adrenal hyperplasia, thyroid dysfunction, Cushing's syndrome, or hyperprolactinemia (based on clinical records).
- History of ovarian surgery (as determined from past medical history).

Ethical approval was obtained from the Institutional Review Board of Lady Reading Hospital and the College of Physicians and Surgeons Pakistan (CPSP). Eligible participants were enrolled after obtaining written informed consent. The purpose, benefits, and potential risks of the study were clearly explained to each participant.

Demographic data including age, duration of symptoms, marital status, place of residence, profession, educational attainment, and socioeconomic status were recorded using a structured proforma. A comprehensive clinical history was taken followed by physical examination.

Pelvic ultrasonography was performed by a consultant radiologist with a minimum of five years of post-fellowship experience, and PCOS was diagnosed based on predefined operational criteria. Relevant hormonal features, including evidence of chronic anovulation, hyperandrogenism, and polycystic ovarian morphology, were also noted.

Data were entered and analyzed using SPSS version 22.0. Continuous variables such as age and symptom duration were presented as mean ± standard deviation (SD) for normally distributed data, or as median with interquartile range (IQR) for non-normally distributed data (assessed via the Shapiro–Wilk test). Categorical variables—including marital status, residence, occupation, education, socioeconomic status, presence of PCOS, and associated hormonal abnormalities—were summarized as frequencies and percentages.

To control for potential confounders, stratification was performed for age, symptom duration, marital status, residence, profession, educational level, and socioeconomic class. Post-stratification analysis was carried out using the Chi-square test, or Fisher's exact test where appropriate ($n \leq 5$). A p-value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 132 obese female patients, aged between 20 and 40 years, were enrolled in the study. The mean age of the participants was 29.7 ± 5.8 years, and the median duration of symptoms was 10 months (IQR: 6–18 months).

Out of 132 patients, 89 (67.4%) were diagnosed with polycystic ovarian syndrome (PCOS) based on ultrasonographic and clinical findings. The remaining 43 (32.6%) were classified as non-PCOS. The most frequently observed hormonal abnormalities among PCOS patients were chronic anovulation (78.7%), clinical/biochemical hyperandrogenism (70.8%), and polycystic ovarian morphology (100%).

In terms of marital status, 85 (64.4%) participants were married, and 47 (35.6%) were unmarried. PCOS was significantly more common among married females (p = 0.037). Additionally, stratified analysis revealed a higher frequency of PCOS among females aged 26–35 years (p = 0.016) and those from urban areas (p = 0.048).

Table 1

Baseline Demographic and Clinical Characteristics (n = 132)

Variable	Mean ± SD / n (%)
Age (years)	29.7 ± 5.8
BMI (kg/m^2)	30.3 ± 3.9
Duration of symptoms (months)	10 (IQR: 6–18)
Marital Status	
- Married	85 (64.4%)
- Unmarried	47 (35.6%)
Residence	
- Urban	91 (68.9%)
- Rural	41 (31.1%)
Profession	
- Employed	39 (29.5%)
- Housewife	93 (70.5%)
Educational Level	

- Primary or below	38 (28.8%)
- Secondary	56 (42.4%)
- Graduate or above	38 (28.8%)

Table 2

Frequency of PCOS and Hormonal Abnormalities (n = 132)

Clinical Feature	n (%)
PCOS Diagnosed	89 (67.4%)
Non-PCOS	43 (32.6%)
Among PCOS Patients (n = 89):	
- Chronic Anovulation	70 (78.7%)
- Hyperandrogenism	63 (70.8%)
- Polycystic Ovarian Morphology (USG)	89 (100%)

Table 3

Stratification of PCOS with Effect Modifiers

Variable	PCOS (n=89)	Non-PCOS (n=43)	p-value
Age (years)			0.016*
- 20–25	21 (23.6%)	19 (44.2%)	
- 26–35	52 (58.4%)	18 (41.9%)	
- 36–40	16 (18.0%)	6 (13.9%)	
Marital Status			0.037*
- Married	66 (74.2%)	19 (44.2%)	
- Unmarried	23 (25.8%)	24 (55.8%)	
Residence			0.048*
- Urban	67 (75.3%)	24 (55.8%)	
- Rural	22 (24.7%)	19 (44.2%)	
Educational Level			0.112
- Primary or below	25 (28.1%)	13 (30.2%)	
- Secondary	38 (42.7%)	18 (41.9%)	
- Graduate or above	26 (29.2%)	12 (27.9%)	

*** Statistically significant (p ≤ 0.05)**

DISCUSSION

This cross-sectional study evaluated the frequency of polycystic ovarian syndrome (PCOS) among obese females aged 20 to 40 years presenting to the Department of Medicine at Lady Reading Hospital, Peshawar. Our findings revealed a notably high frequency of PCOS, affecting 67.4% of the study population. This figure is consistent with previous literature indicating a strong association between obesity and the prevalence of PCOS. Obesity exacerbates the hormonal and metabolic disturbances characteristic of PCOS, including insulin resistance, hyperandrogenism, and chronic anovulation. These pathophysiological mechanisms may explain the elevated prevalence observed in our cohort.

Among patients diagnosed with PCOS, chronic anovulation and hyperandrogenism were prevalent in 78.7% and 70.8% of cases, respectively, while polycystic ovarian morphology was universally present. This aligns with the Rotterdam criteria, which emphasize the diagnostic value of these three features. The high rate of sonographic findings highlights the importance of imaging in the evaluation of suspected PCOS cases, especially in resource-limited settings where biochemical assessments may not always be feasible.

Stratification analysis further revealed statistically significant associations between PCOS and several demographic variables. Females aged 26–35 years showed a higher prevalence of PCOS compared to other age groups (p = 0.016), suggesting that reproductive age may influence hormonal sensitivity and expression of PCOS symptoms. Married women were more frequently diagnosed with PCOS (p = 0.037), possibly due to increased health-seeking behavior prompted by infertility concerns. Urban residence was also significantly associated with PCOS (p = 0.048), potentially reflecting lifestyle-related risk factors such as sedentary behavior, dietary patterns, and stress.

Although education level and profession did not show statistically significant associations, trends suggest that socioeconomic and environmental influences may still contribute to PCOS risk and presentation. These findings highlight the multifactorial nature of PCOS and underscore the need for holistic approaches to diagnosis and management, particularly in high-risk populations such as obese females.

The strengths of this study include a well-defined sampling strategy, adherence to international diagnostic criteria, and the use of experienced radiologists for ultrasound evaluation. However, limitations should be acknowledged. The study was conducted at a single center, which may affect the generalizability of the findings. Furthermore, due to resource constraints, hormonal assays were not uniformly performed, and reliance on clinical assessment may have introduced some diagnostic variability.

In conclusion, the study confirms a high burden of PCOS among obese reproductive-age females and underscores the importance of early identification and multidisciplinary management. These findings advocate for routine screening of PCOS in obese women in outpatient settings and the development of targeted interventions aimed at weight reduction, lifestyle modification, and hormonal regulation.

CONCLUSION

This study highlights a significant burden of polycystic ovarian syndrome (PCOS) among obese reproductive-age women, with a frequency of 67.4% in the local population. Chronic anovulation and hyperandrogenism were prevalent, with universal detection of polycystic ovarian morphology on ultrasound. Notably, PCOS was more common in women aged 26–35 years, married individuals, and urban residents, indicating that demographic factors may influence risk. These findings emphasize the need for routine screening in obese women presenting to outpatient departments, especially in regions with similar sociodemographic patterns. Addressing PCOS at an early stage through weight reduction, lifestyle modification, and hormonal regulation could significantly reduce the risk of infertility and long-term metabolic complications. Public health strategies should also focus on raising awareness and providing accessible care for this underdiagnosed yet impactful condition in obese populations.

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