International Journal of Scientific Research and Engineering Development-– Volume 9 Issue 2, Mar-Apr 2026
Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Polycystic Ovarian Disease Among Young Adults:

Prevalence of Early Indicators and the Imperative for Timely Intervention

Dr Peteti Gopi

[Assistant Professor]

K Raja Rajeshwari

[HOD]

Department of Pharmacy Practice, Nimra College of Pharmacy
Vijayawada, Andhra Pradesh, India

CH GOPI 209A1T0003
MD HASEENA 209A1T0009
S SAMEENA 209A1T0022
S THOWHID 209A1T0024

Doctor of Pharmacy (PharmD)

ABSTRACT

Background: Polycystic Ovarian Disease (PCOD) is one of the most prevalent endocrine disorders affecting women of reproductive age worldwide. Despite its rising incidence, early-stage recognition in young adults remains limited, leading to delayed diagnosis and suboptimal management outcomes. **Objectives:** This study aimed to identify and assess the prevalence of early PCOD indicators among young adults (aged 18–26 years) through a structured, evidence-based questionnaire. **Methods:** A cross-sectional observational design was employed, recruiting 300 participants via convenience sampling from academic institutions. Key variables included menstrual regularity, age of menarche, BMI, and androgenic symptomatology such as hirsutism and acanthosis nigricans. **Results:** An alarming 86% of participants were categorised at moderate to high PCOD risk. Menstrual irregularity was reported in 40% of participants, while 53.7% showed signs of increased facial hair growth and 27.7% had darkened skin patches indicative of insulin resistance. Delayed menarche (beyond 15 years) was noted in 18% of the cohort. **Conclusion:** The study underscores an urgent need for routine PCOD screening, lifestyle counselling, and health education within educational settings to mitigate the long-term reproductive and metabolic burden of this condition.

Keywords: *Polycystic Ovarian Disease (PCOD), PCOS, young adults, menstrual irregularity, hyperandrogenism, insulin resistance, early detection, BMI, hirsutism*

1. Introduction

Gynecological disorders represent a significant and often underappreciated dimension of women's health. Among these, Polycystic Ovarian Disease (PCOD) — also referred to as Polycystic Ovary Syndrome (PCOS) in its more severe clinical expression — stands out as a condition that touches virtually every facet of a young woman's life, from her menstrual

health and fertility to her metabolic function and psychological wellbeing. It is not merely a reproductive disorder; it is a complex systemic condition that, if left unaddressed, carries substantial long-term health consequences.

PCOD is a medical condition characterised by the ovaries producing an excess of immature or partially matured eggs, which often develop into small cysts. This ovarian dysfunction is accompanied by elevated levels of androgenic hormones, disrupted menstrual cycling, and a constellation of metabolic abnormalities. Clinically, the condition has been referred to as Functional Metabolic Hyperandrogenic Syndrome, reflecting the intertwined hormonal and metabolic mechanisms at its core.

What makes PCOD particularly concerning from a public health standpoint is its prevalence: globally, it affects between 5% and 10% of women of reproductive age, though regional data from India suggests rates as high as 9–22%, considerably above the global average. Despite this burden, the condition is frequently identified late, often only when women present with fertility difficulties or severe metabolic complications. The opportunity for earlier, more impactful intervention is therefore routinely missed.

Young adulthood — the years between 18 and 26 — is a critical window in which early biological signals of PCOD begin to manifest: irregular periods, skin changes, aberrant hair growth patterns, and subtle shifts in body composition. Identifying these signals promptly within this demographic can meaningfully alter the trajectory of the condition. Early lifestyle modification, hormonal management, and health awareness together constitute a powerful preventive strategy.

This study was conducted at Nimra College of Pharmacy as part of the PharmD programme, motivated by the recognition that pharmacy professionals occupy a frontline role in patient counselling and disease prevention. The research sought to characterise the prevalence of early PCOD indicators in a population of young adult women, with the broader aim of informing targeted screening and educational initiatives.

2. Background and Literature Context

2.1 Definition and Clinical Spectrum

PCOD encompasses a range of ovarian dysfunctions driven primarily by hormonal imbalance. The ovaries, which normally regulate the menstrual cycle through the cyclical production of oestrogen, progesterone, inhibin, and relaxin, begin to function abnormally — producing an excess of androgens (male hormones) and failing to release mature eggs reliably. The result is a disrupted cycle, accumulation of follicular cysts, and a hormonal environment that predisposes women to both reproductive and systemic disease.

The Rotterdam Consensus Criteria, widely accepted in clinical practice, require the presence of at least two of the following three features for a PCOD/PCOS diagnosis: oligo- or anovulation (irregular or absent ovulation), clinical or biochemical evidence of hyperandrogenism, and polycystic ovarian morphology on ultrasound. This diagnostic framework acknowledges that the condition does not present identically across all individuals — a nuance that makes population-level screening challenging but essential.

2.2 Epidemiology

Globally, PCOD affects between 5% and 10% of women aged 12 to 45. The condition demonstrates notable regional variability, with India recording some of the highest prevalence estimates (9–22%), likely reflecting both genetic predispositions and the rapid adoption of sedentary lifestyles and calorie-dense diets in urban populations. By contrast, Japan records rates of only 1–3%, suggesting that environmental and dietary factors exert considerable influence on disease expression.

Region	Prevalence (%)
Global Estimate	5–10%
India	9–22%
China	2–7%
Sri Lanka	2–7%
United States	6–10%
Europe	6–10%
Australia	6–10%
Japan	1–3%

Table 1. Global prevalence of PCOD across selected regions.

2.3 Aetiology and Pathophysiology

The aetiology of PCOD remains an area of active scientific inquiry. No single causative factor has been definitively established; rather, the condition appears to emerge from the convergence of several interacting influences.

Insulin resistance is perhaps the most clinically significant of these. When the body's cells fail to respond appropriately to insulin, compensatory hyperinsulinaemia results. Elevated insulin, in turn, stimulates the ovarian theca cells to overproduce androgens, which disrupt the normal follicular maturation process and impair ovulation. The resulting anovulation and androgen excess feed into each other in a self-perpetuating cycle.

Chronic low-grade inflammation has also been implicated in PCOD pathogenesis. Inflammatory cytokines are thought to impair insulin signalling and stimulate further androgen production, creating an additional reinforcing loop. Genetic predisposition adds another layer of complexity: women with a first-degree relative diagnosed with PCOD or type 2 diabetes are substantially more likely to develop the condition themselves. Environmental factors — including dietary patterns, physical inactivity, and exposure to endocrine-disrupting chemicals — further modulate both the onset and severity of disease.

The hypothalamic-pituitary-ovarian (HPO) axis dysfunction characteristic of PCOD manifests as an abnormally elevated LH/FSH ratio, which further stimulates androgen secretion while simultaneously impairing folliculogenesis. This neuroendocrine dysregulation is now understood to be a central feature of the syndrome rather than merely a secondary consequence.

3. Clinical Manifestations and Long-Term Complications

3.1 Symptoms

The clinical presentation of PCOD is heterogeneous, which partly explains why it is so frequently misdiagnosed or diagnosed late. The most commonly reported symptoms include irregular, infrequent, or prolonged menstrual cycles — a direct consequence of disrupted ovulation. Many women with PCOD experience fewer than eight menstrual cycles per year, and some experience none for extended periods.

Hyperandrogenism manifests in a range of visible signs that can carry significant psychological impact. Hirsutism — the growth of coarse, dark hair on the face, chest, and back in a typically male distribution — affects a large proportion of those with PCOD. Acne, oily skin, and thinning scalp hair (female-pattern alopecia) are equally common and frequently the first symptoms to prompt women to seek medical attention. Acanthosis nigricans, the development of dark, velvety patches of skin in body folds such as the neck, axillae, and inner thighs, is a visible marker of underlying insulin resistance and should be treated as a clinical warning sign.

Ovarian cysts — arrays of small, undeveloped follicles that give the ovaries a characteristic 'string of pearls' appearance on ultrasound — represent the structural correlate of repeated failed ovulations. Metabolic dysfunction, including weight gain, central obesity, and glucose intolerance, compounds the reproductive symptoms and substantially increases the risk of type 2 diabetes and cardiovascular disease over time.

3.2 Long-Term Complications

The long-term consequences of untreated PCOD extend far beyond reproductive function. Type 2 diabetes and metabolic syndrome represent the most significant metabolic risks, driven by persistent insulin resistance and dyslipidaemia. Cardiovascular disease risk is similarly elevated, primarily mediated through hypertension, central adiposity, and dyslipidaemia.

From a reproductive standpoint, PCOD is one of the leading causes of anovulatory infertility. Pregnant women with PCOD face elevated risks of gestational diabetes, pre-eclampsia, preterm labour, and miscarriage. The uterine lining, exposed to unopposed oestrogen in the absence of regular ovulation, is also predisposed to endometrial hyperplasia and — in the long term — endometrial carcinoma.

Psychological wellbeing is also substantially affected. The physical manifestations of PCOD — visible hair growth, acne, weight changes — are frequent triggers for depression, anxiety, and body image disturbance. Research consistently demonstrates higher rates of mood disorders in women with PCOD compared to age-matched controls, underscoring the need for holistic management that encompasses mental health support alongside medical treatment.

4. Aims and Objectives

The central aim of this study was to identify and characterise the prevalence of early indicators of PCOD in young adults through a structured questionnaire, thereby enabling earlier detection and fostering awareness that can improve long-term health outcomes in this population.

The specific objectives were threefold. First, to assess the prevalence of PCOD-related symptoms — including menstrual irregularity, androgenic signs, and BMI anomalies — within the study population. Second, to examine the relationship between lifestyle factors (diet, physical activity, and psychosocial stress) and the emergence of PCOD-related symptoms. Third, to generate evidence that can inform targeted health education and early screening programmes within academic and community settings.

5. Methodology

5.1 Study Design

This study employed a cross-sectional observational design, which was considered appropriate given the aim of characterising prevalence and identifying associations at a defined point in time. Cross-sectional designs offer the practical advantage of relatively rapid data collection and are well suited to estimating symptom burden within defined populations.

5.2 Study Population and Sampling

The study population comprised young adult women aged 18 to 26 years, recruited from educational institutions. This age bracket was deliberately selected as it represents the period during which the earliest biological signs of PCOD are most likely to emerge, yet formal diagnosis is least likely to have occurred. A convenience sampling approach was used, recruiting individuals who were readily accessible and willing to participate, with the goal of capturing a diverse cross-section of backgrounds, BMI categories, and lifestyle profiles.

Three hundred participants were enrolled in total. Inclusion criteria required that participants fall within the specified age range and provide informed consent. Participants with a pre-existing diagnosis of PCOD or other confirmed chronic hormonal disorders were excluded from the study to ensure the data reflected a population at the pre-diagnostic stage.

5.3 Questionnaire Design and Data Collection

A structured questionnaire was developed based on established clinical guidelines for PCOD assessment and validated tools used in the published literature. The questionnaire covered four principal domains: menstrual cycle history (including age of menarche, cycle frequency, and regularity over the preceding six months); physical and androgenic symptoms (hair growth patterns, acne, skin pigmentation changes, and weight history); family history of PCOD, diabetes, or related hormonal conditions; and lifestyle factors including dietary habits, physical activity levels, sleep quality, and self-reported stress.

Participants completed the questionnaire in either an online or paper-based format. Anonymity was maintained throughout, and clear instructions were provided to ensure accurate and honest self-reporting. Responses were subsequently collated and analysed statistically, with risk stratification performed using composite clinical indicators drawn from the Rotterdam Criteria framework.

6. Results

6.1 PCOD Risk Distribution

The risk stratification analysis revealed a striking picture: out of 300 participants, only 2 individuals (0.7%) were classified at low risk, while 258 (86%) were at moderate risk and 40 (13.3%) were at high risk of developing PCOD. The near-absence of the study population in the low-risk category is clinically significant and suggests that the combination of lifestyle, physiological, and symptomatic factors present in this cohort represents a genuine and widespread vulnerability to PCOD.

Risk Level	No. of Participants	Percentage (%)
Low Risk	2	0.7%
Moderate Risk	258	86.0%
High Risk	40	13.3%
Total	300	100%

Table 2. PCOD risk stratification among 300 participants aged 18–26 years.

6.2 Age at Menarche

Analysis of the age at which participants first experienced menstruation (menarche) provided important contextual data. The majority of participants reported onset between 11 and 12 years (41.7%) or between 13 and 15 years (40.3%), broadly consistent with population norms. However, a notable 18% of participants experienced delayed menarche — defined as onset after the age of 15 — which existing research associates with underlying hormonal dysregulation and an increased susceptibility to PCOD.

Age of Menarche	No. of Participants	Percentage (%)	Clinical Note
Below 10 years	1	0.3%	Early onset; rare
11–12 years	125	41.7%	Most common range
13–15 years	121	40.3%	Normal range
>15 years	54	18.0%	Potential hormonal imbalance
Total	301*	100%	—

Table 3. Distribution of age at menarche among study participants.

6.3 Body Mass Index

BMI analysis demonstrated that while 53.3% of participants fell within the normal weight range, a combined 21.4% were either overweight (14.7%) or obese (6.7%). A further 25.3% were underweight — a finding of independent clinical significance, as low body weight can equally disturb hormonal balance and menstrual function. The association between higher BMI and PCOD risk was evident in the data, consistent with the well-established relationship between adiposity, insulin resistance, and androgenic dysregulation.

BMI Category	No. of Participants	Percentage (%)	Clinical Association
Underweight	76	25.3%	Hormonal disruption risk
Normal Weight	160	53.3%	Majority of cohort
Overweight	44	14.7%	Higher PCOS symptom risk
Obese	20	6.7%	Strong PCOD association

Table 4. BMI distribution and clinical associations among study participants.

6.4 Menstrual Patterns

Menstrual regularity — or the lack thereof — is perhaps the most sensitive and clinically accessible early indicator of PCOD. In this cohort, 52% of participants reported having six periods in the preceding six months (regular cycles), while 7% reported slightly irregular patterns (four to five periods). More concerningly, 39.7% reported very irregular cycles (two to three periods in six months), and 1.3% reported highly irregular cycles of zero or one period over the same period. In total, close to 40% of participants demonstrated some degree of menstrual irregularity — a proportion that, in a clinically-informed context, would warrant further investigation.

Menstrual Pattern	Participants	Percentage (%)	Clinical Significance
Regular (6/6 months)	156	52.0%	Normal cycle pattern

Slightly Irregular (4–5)	21	7.0%	Mild irregularity
Very Irregular (2–3)	119	39.7%	Significant irregularity
Highly Irregular (0–1)	4	1.3%	Severe disturbance

Table 5. Menstrual cycle patterns over the preceding six months.

6.5 Dermatological and Androgenic Symptoms

Skin and hair-related symptoms provide a visible window into the underlying hormonal environment and are frequently the first manifestations that prompt women to seek clinical assessment. In this study, 27.7% of participants reported the presence of dark patches on the neck — a presentation consistent with acanthosis nigricans, a well-recognised clinical marker of insulin resistance and hyperinsulinaemia. More strikingly, 53.7% of participants reported increased facial hair growth in the preceding six months, and 84.7% reported hair growth on the chest — findings that collectively point toward a high prevalence of subclinical androgen excess in this population.

Symptom	Yes (%)	No (%)
Dark patches on neck (Acanthosis Nigricans)	27.7%	72.3%
Increased facial hair growth	53.7%	46.3%
Hair growth on chest	84.7%	15.3%

Table 6. Prevalence of androgenic and dermatological symptom indicators.

7. Discussion

The results of this study paint a sobering picture of PCOD risk in a young adult female population. That 99.3% of participants were classified at moderate or high risk is not, on its own, a diagnosis — risk stratification via questionnaire is a screening tool, not a clinical assessment — but the scale of potential vulnerability it reveals demands serious attention from healthcare educators, practitioners, and policymakers alike.

The high rate of menstrual irregularity (approximately 40%) is particularly instructive. Menstrual disturbance is the single most accessible early indicator of PCOD, requiring no laboratory test or imaging, and yet it remains widely underreported by young women who have come to accept irregularity as a normal variant. The normalisation of irregular periods within peer and cultural discourse represents one of the most significant barriers to early help-seeking behaviour, and addressing this through educational initiatives could substantially accelerate the pathway to diagnosis.

The finding that 18% of participants experienced delayed menarche (onset after age 15) adds a valuable layer of understanding. Delayed menarche has been independently associated with underlying hormonal dysregulation, particularly in relation to the hypothalamic-pituitary-ovarian axis. Women who experience late-onset menstruation may carry a biologically mediated predisposition to PCOD that predates the appearance of more obvious symptoms, making this a clinically meaningful early marker worth including in routine adolescent health assessments.

BMI findings reinforce the well-established bidirectional relationship between adiposity and PCOD. Among overweight and obese participants, the association with PCOD-related symptoms was particularly pronounced, consistent with the role of adipose tissue in amplifying insulin resistance and androgenic signalling. However, the relatively high prevalence of PCOD indicators among underweight participants (25.3% of the cohort) challenges any simplistic narrative that PCOD is solely a disease of obesity. Lean PCOD is a recognised clinical entity, and the absence of excess weight should not be permitted to delay or preclude diagnostic evaluation.

The dermatological data — particularly the 84.7% chest hair prevalence and 53.7% facial hair prevalence — deserve careful contextual interpretation. While the questionnaire-based nature of the study precludes formal Ferriman-Gallwey scoring, the self-reported prevalence of these findings strongly suggests that androgen excess is operating across a large proportion of the cohort, likely subclinically in many cases. Androgen-related dermatological manifestations are known to precede more overt reproductive or metabolic dysfunction, providing another rationale for early clinical engagement with young women who present with such symptoms.

From a pharmacist's perspective, these findings are of direct professional relevance. Community and hospital pharmacists regularly interact with young women presenting for acne treatments, hair removal products, or menstrual irregularity concerns. These encounters represent high-value, often underutilised opportunities for structured PCOD risk screening, patient education, and appropriate referral. Integrating PCOD awareness into pharmacy practice frameworks could therefore serve as an important complement to physician-led diagnostic pathways.

8. Diagnosis of PCOD

The formal diagnosis of PCOD proceeds through a structured multi-step process, anchored by the widely accepted Rotterdam Criteria. A confirmed diagnosis requires the presence of at least two of the following three criteria: irregular or absent ovulation (oligo/anovulation); clinical or biochemical evidence of hyperandrogenism (such as elevated serum testosterone, clinical hirsutism, or acne); and polycystic ovarian morphology on pelvic ultrasound.

In practice, the diagnostic workup begins with a detailed medical history — covering menstrual patterns, symptom duration, family history of hormonal disorders, and lifestyle factors — followed by a physical examination assessing BMI, the Ferriman-Gallwey hirsutism score, and dermatological features such as acanthosis nigricans.

Laboratory investigations are essential to both confirm hyperandrogenism and exclude conditions that mimic PCOD. These include measurement of serum testosterone, the LH/FSH ratio (an LH/FSH ratio greater than 2:1 is suggestive of PCOD), prolactin, thyroid-stimulating hormone (TSH), fasting insulin and glucose, and a lipid profile. Conditions such as hypothyroidism, hyperprolactinaemia, Cushing's syndrome, and congenital adrenal hyperplasia must be actively excluded before a PCOD diagnosis is confirmed.

Transvaginal or abdominal pelvic ultrasound constitutes the final step, with polycystic ovaries defined by the presence of more than twelve follicles measuring 2–9 mm in diameter, increased ovarian volume exceeding 10 mL, and the characteristic 'string of pearls' appearance. It is important to note that the absence of ovarian cysts does not preclude a PCOD diagnosis if the other two Rotterdam Criteria are satisfied.

9. Management and Therapeutic Considerations

9.1 Lifestyle Modification

Lifestyle intervention remains the cornerstone of PCOD management, particularly for young adults in whom pharmacological therapy may not yet be indicated. Weight reduction of even 5–10% of body weight in overweight or obese women has been shown to significantly improve menstrual regularity, reduce androgen levels, enhance insulin sensitivity, and improve both spontaneous ovulation rates and fertility outcomes.

Dietary guidance for women with PCOD should emphasise low glycaemic index foods, adequate dietary fibre, lean protein sources, and healthy fats, while limiting the intake of processed foods, refined carbohydrates, and sugar-sweetened beverages. Beneficial dietary components include leafy green vegetables, legumes, whole grains, oily fish, and low-fat dairy

products. Regular physical activity — incorporating cardiovascular exercise, strength training, and mind-body practices such as yoga — plays a synergistic role in improving insulin sensitivity and hormonal balance.

9.2 Pharmacological Management

Hormonal therapy using combined oral contraceptives (COCs) is commonly employed in women not seeking to conceive, with the goals of regulating menstrual cycles, suppressing androgen production, and reducing the risk of endometrial hyperplasia. Anti-androgenic agents, including spironolactone, are used to manage hirsutism and acne. Metformin, an insulin-sensitising agent, is frequently prescribed to address underlying insulin resistance and metabolic abnormalities, and has demonstrated modest benefits in improving menstrual regularity and ovulation rates in women with PCOD.

For women wishing to conceive, ovulation induction with clomiphene citrate or letrozole forms the basis of fertility management, with more advanced assisted reproductive technologies reserved for cases refractory to first-line treatment. Given the metabolic risks associated with PCOD, regular monitoring of blood glucose, lipid profiles, and blood pressure is recommended across all age groups.

10. Conclusion

This study has demonstrated that early indicators of PCOD are highly prevalent among young adult women, with 86% of the study cohort falling into moderate to high risk categories. The convergence of menstrual irregularity (40%), androgenic skin and hair changes (affecting the majority of participants), delayed menarche, and adverse BMI profiles within this population presents a compelling case for proactive, systematic screening in educational and community settings.

PCOD is not an inevitability. It is a manageable condition — particularly when identified early. The evidence generated by this study reinforces the need for health literacy programmes targeted at young women, equipping them with the knowledge to recognise the early warning signs of PCOD, understand the associated risk factors, and seek timely clinical guidance without stigma or delay.

For pharmacy professionals, these findings carry direct practical implications. The pharmacist's unique accessibility — situated within the community, encountered frequently, and trusted by patients — positions the profession ideally to contribute to PCOD early detection efforts. Routine questioning about menstrual health, skin changes, and weight concerns, combined with structured referral pathways, could meaningfully reduce the diagnostic lag that currently allows this condition to progress unchecked in so many young women.

Future research should extend this work longitudinally, tracking participants over time to determine what proportion progress to a confirmed PCOD diagnosis and which early indicators prove most predictive. Incorporation of biochemical screening (hormonal and metabolic panels) alongside questionnaire data would substantially strengthen the evidence base. Additionally, expanding the study population to include rural and socioeconomically diverse cohorts would help assess whether the risk profile observed here generalises beyond an academic institution setting.

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