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Original Research Article

Frequency and clinical profile of polycystic ovary syndrome among young Indian women presenting with menstrual irregularities: a hospital-based cross-sectional study

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ABSTRACT

Background: Polycystic ovary syndrome (PCOS) is a highly prevalent reproductive endocrinopathy. Diagnosing PCOS in adolescents and young adults presents major challenges due to physiological overlaps with normal pubertal development. This study aimed to determine the clinical frequency of PCOS among young women (15–24 years) presenting with menstrual irregularities at a tertiary care hospital in South India, and to characterize their anthropometric, clinical, and biochemical profiles.
Methods: This hospital-based cross-sectional study evaluated 180 young women (15–24 years) presenting with menstrual irregularities over a 12-month period. Participants were stratified into adolescents (15–19 years; diagnosed via international evidence-based guidelines) and young adults (20–24 years; diagnosed via modified Rotterdam criteria). Clinical parameters, hormone profiles, and transabdominal pelvic ultrasound metrics were recorded.
Results: Among 180 symptomatic participants, 114 met age-specific criteria for PCOS, yielding a clinical frequency of 63.3% within this cohort. Within the PCOS arm, 40.4% (n =46) were adolescents and 59.6% (n=68) were young adults. Clinical hyperandrogenism was highly prominent (hirsutism: 48.9%; acne: 36.7%), starkly outstripping biochemical hyperandrogenaemia (5.0%). Statistically significant differences were identified between the PCOS and non-PCOS cohorts regarding mean age (20.66±1.82 vs.19.91±2.02 years, p=0.014)), mean BMI (24.17±5.67 vs. 22.20±3.58kg/m2, p=0.020), mean luteinizing hormone (9.38±4.21 vs 8.24±3.11IU/l, p = 0.041), and mean thyroid stimulating hormone levels (2.78±2.51 vs. 2.23±1.41mIU/l, p=0.040).
Conclusions: PCOS is the primary driver of menstrual irregularities in young seeking-care populations in this demographic. The divergence between prominent clinical hyperandrogenism and low biochemical hyperandrogenaemia emphasizes the clinical reliance on standardized physical evaluations over routine biochemical assays for effective early screening.

Keywords: Adolescent gynaecology, Hirsutism, Hyperandrogenism, Polycystic ovary syndrome, Rotterdam criteria

INTRODUCTION

The regular establishment of the menstrual cycle is a landmark physiological milestone in adolescent development, reflecting the functional maturation of the hypothalamic-pituitary-ovarian (HPO) axis. Disruptions to this delicate endocrine regulatory window frequently manifest as menstrual irregularities. PCOS is the most ubiquitous reproductive endocrinopathy, affecting an estimated 8% to 13% of reproductive-aged women and 6% to 18% of adolescent girls globally, depending on the diagnostic criteria applied and the population sampled.[1,24] First characterized by Stein et al and Leventhal et al in 1935 as a triad of menstrual disturbances, hirsutism, and enlarged polycystic ovaries 25, the modern understanding of PCOS has evolved from a purely morphological description to a complex, multi-system metabolic and endocrine syndrome. The condition is fundamentally

defined by ovulatory dysfunction, hyperandrogenism, and metabolic risks often driven by insulin resistance, carrying long-term risks for type 2 diabetes mellitus, metabolic syndrome, and cardiovascular disease.

Diagnosing PCOS in young women remains a substantial clinical challenge.[7,10,15] During the pubertal transition, transient physiological features such as anovulatory cycle irregularities, adolescent acne, and multi-follicular ovarian architecture closely mimic the pathognomonic features of adult PCOS.[2,9] Consequently, utilizing adult diagnostic criteria broadside in adolescents risks substantial over-diagnosis, while delayed recognition deprives patients of vital early lifestyle interventions.[6]

In India, and particularly within South populations experiencing hazardous trends of rising metabolic disorders, PCOS represents a major public health challenge.[7,10,15] Despite its escalating burden, robust evidence characterizing the precise clinical and biochemical spectrum of young patients remains limited. This cross-sectional study was designed to evaluate the clinical frequency and detailed phenotypic characteristics of PCOS among young women aged 15–24 presenting with menstrual irregularities at a major tertiary care university teaching hospital in Kerala, India.[11-16]

METHODS

Study design and setting

This prospective, institutional cross-sectional study was conducted between 1 April 2021 and 31 March 2022, at the Outpatient Department of Obstetrics and Gynaecology, Government Medical College, Kozhikode, Kerala, India.

Participants and selection criteria

The study population comprised 180 young women aged 15–24 years presenting with a primary complaint of menstrual irregularities. Menstrual irregularities were defined as oligomenorrhea (cycle length >35 days or <8 cycles per year). Amenorrhea (absence of menstruation for 3 to 6 months). Polymenorrhea/heavy menstrual bleeding.

Inclusion criteria

Age 15–24 years, presence of menstrual irregularities sustained for a minimum of 6 months, and informed written consent from the participant and/or legal guardian.

Exclusion criteria

Gynaecological age <1-year post-menarche; concurrent use of hormonal contraceptives, glucocorticoids, or insulin-sensitizing medications within the prior 3 months and established alternate causes of anovulation or hyperandrogenism, including thyroid disorders, hyperprolactinemia, non-classic congenital adrenal hyperplasia (NCAH), Cushing's syndrome, or androgen-secreting tumours.

Diagnostic framework

To insulate the diagnostic process against adolescent pubertal overlap, participants were stratified and evaluated via distinct, age-specific criteria.

Adolescent cohort (aged 15–19 years)

Diagnosed strictly according to the international evidence-based PCOS Guidelines.[26] Diagnosis required the simultaneous presence of both irregular menstrual cycles (defined by age-specific intervals post-menarche) and evidence of hyperandrogenism (clinical and/or biochemical). In accordance with these guidelines, pelvic ultrasonography was excluded as a diagnostic criterion for this cohort.

Young adult cohort (aged 20–24 years)

Diagnosed using the Modified Rotterdam Criteria 27, requiring the presence of at least two of the following three features: oligo- and/or anovulation, clinical and/or biochemical hyperandrogenism, and polycystic ovarian morphology (PCOM) via ultrasound, following the exclusion of mimicking pathologies.

Clinical and anthropometric assessments

A comprehensive history was taken for each participant, covering menstrual chronology, years post-menarche, family history of metabolic/endocrine disease in first-degree relatives, and self-reported lifestyle and dietary factors. Physical examinations recorded height (cm), weight (kg), and calculation of body mass index (weight in kg/height in m2). Central adiposity was tracked by measuring waist circumference (at the umbilical level) and hip circumference (at the greater trochanter) to compute the waist-to-hip ratio (WHR). Clinical hyperandrogenism was systematically quantified using.

Hirsutism

Evaluated using the modified Ferriman-Gallwey (mFG) scoring system mapping 11 body zones.[27] A cumulative score of was established as the threshold for clinical hirsutism.

Acne

Graded via the Pillsbury scale; only moderate-to-severe comedonal or inflammatory acne was classified as positive for hyperandrogenic clinical assessment.

Biochemical and imaging assays

Fasting morning blood samples were drawn during the early follicular phase (days 2–5) in cycling women, or

randomly in amenorrheic individuals. Biochemical evaluations included: free testosterone, 17-hydroxyprogesterone (17-OHP), LH, FSH, PRL free triiodothyronine (FT3), free thyroxine (FT4), and TSH. Pelvic ultrasonography was performed uniformly via a TAUS) with a full bladder to protect patient preferences in unmarried cohorts. PCOM was verified if at least one ovary exhibited an increased volume and/or the presence of follicles measuring 2–9 mm in diameter arranged peripherally around an echo-dense stroma. For the adolescent cohort (aged 15–19 years), transabdominal ultrasound sweeps were performed strictly for exploratory observation and to rule out concurrent pelvic pathology or androgen-secreting neoplastic masses. In strict adherence to the international evidence-based PCOS guidelines, radiological evidence of polycystic ovarian morphology was entirely excluded from the diagnostic algorithm for the 15–19 age group, ensuring that diagnoses within this cohort rested solely on the concurrent presentation of ovulatory dysfunction and hyperandrogenic features.

Statistical analysis

Data processing was executed using SPSS Version 11.0. Continuous clinical and biochemical parameters were expressed as means standard deviations (Mean±SD), and groups were compared using the independent-samples t-test. Categorical variables were expressed as frequencies and percentages, analysed via the Chi-square test. Statistical significance was defined as a p value<0.05.

RESULTS

Demographics and general cohort characteristics

Out of the 180 young women presenting with menstrual irregularities, 114 met the specific diagnostic criteria for PCOS, establishing a clinic frequency of 63.3%, while 66 participants (36.7%) constituted the symptomatic non-PCOS group. The peak age concentration for clinical presentation fell into the 20-year-old (23.9%) and 21-year-old (20.0%) cohorts. Stratification by diagnostic thresholds demonstrated that 46 cases (40.4%) were adolescents diagnosed via the International Guidelines, whereas 68 cases (59.6%) were adults meeting the modified Rotterdam criteria. A positive family history of PCOS or metabolic syndrome in a first-degree relative was recorded in 15.6% (n=28) of the total population. Sedentary lifestyle patterns were identified in 18.9% (n=34), and an unhealthy, highly processed dietary pattern was reported by 20.5% (n=37) of the participants.

Clinical manifestations and symptomatology

Analysis of primary complaints at initial presentation showed that irregular menstrual periods dominated the clinical landscape (56.1%, n=101), followed by complaints of excessive male-pattern hair growth (19.4%, n=35), acne (13.3%, n=24), and heavy uterine bleeding (11.1%, n=20). Overall objective evaluation for hyperandrogenic signs revealed clinical hirsutism (mFG score ≥8) in 48.9% (n=88) of all subjects and moderate-to-severe acne in 36.7% (n=66). Concurrent presentation of both acne and hirsutism occurred in 17.78% (n=32) of the study sample.

Radiological and biochemical profiling

Objective transabdominal ultrasound assessment confirmed polycystic ovarian morphology in 36.0% (n=65) of the total population. PCOM was observed in 26.4% (n=14) of adolescents aged 15–19 years, and in 40.16% (n=51) of young adults aged 20–24 years. Biochemically, elevated free testosterone levels indicative of biochemical hyperandrogenaemia were found in only 5.0% (n=9) of the total cohort, showing a sharp contrast with clinical markers. Serum LH was elevated in 53.3% (n=96) of the study population.

Comparative analysis: polycystic ovary syndrome versus non- polycystic ovary syndrome groups

Comparative evaluation between the confirmed PCOS cases and symptomatic non-PCOS controls identified critical physiological and endocrine divergence points, as summarized in Table 1.

Table 1: Anthropometric, biochemical, and endocrine comparison of groups.

Variable measured	PCOS present (n=114)	PCOS absent (n=66)	P value
Chronological age (in years)	20.66±1.82	19.91±2.02	0.014
Body mass index (kg/m²)	24.17±5.67	22.20±3.58	0.020
Waist-to-hip ratio (WHR)	0.837±0.111	0.808±0.094	0.066
Serum 17-OHP (ng/ml)	2.66±0.46	2.55±0.49	0.130
Luteinizing hormone (LH, IU/l)	9.38±4.21	8.24±3.11	0.041
Follicle stimulating hormone (IU/l)	3.84±1.04	3.85±1.18	0.980
Free testosterone (ng/dl)	0.374±0.389	0.293±0.206	0.067
Serum prolactin (ng/ml)	16.53±3.22	17.09±4.22	0.350
Free T3 (pg/ml)	290.73±53.58	293.66±48.11	0.700
Free T4 (ng/dl)	0.813±0.130	0.890±0.640	0.310
Thyroid stimulating hormone (mIU/l)	2.78±2.15	2.23±1.41	0.040

Table 2: Anthropometric BMI classifications of the study cohort.

Clinical BMI classifications	Range thresholds	Patient count (n=180)	Percentage of study cohort
Underweight	<18.5 kg/m^2	19	10.56
Normal weight	18.5–22.9 kg/m^2	101	56.11
Overweight	23-24.9 kg/m^2	49	27.22
Obese (Class I/II)	≥25 kg/m^2	11	6.11

The mean chronological age of the PCOS group was significantly higher than the non-PCOS group (p=0.014). Anthropometric assessment demonstrated that the mean BMI was significantly higher in women with PCOS (24.17±5.67 kg/m2) compared to the non-PCOS group (22.20±3.58 kg/m2). While the absolute proportion of elevated waist-to-hip ratio (>0.85) tracked similarly across both groups (31.6% vs 31.8%), the mean WHR trended higher in the PCOS arm but fell short of significance (0.837 vs 0.808, p=0.066).

Among biochemical metrics, LH demonstrated statistically significant elevation in the PCOS cohort compared to the non-PCOS control (9.38±4.21vs. 8.24±3.11IU/l, p=0.041). Furthermore, mean serum TSH concentrations were significantly higher in the PCOS group than in non-PCOS controls (2.78±2.15 vs. 2.23±1.41mIU/l, p=0.040).

DISCUSSION

This study evaluated the clinical presentation and diagnostic frequency of PCOS in a highly targeted, vulnerable population: young women between 15 and 24 years of age actively seeking care for menstrual irregularities at a tertiary institution in South India. Within this symptomatic population, 63.3% were confirmed to have PCOS. This prominent diagnostic cluster is significantly higher than general population prevalence figures, which vary between 8% and 13% globally.[1,24] This difference highlights a key clinical point: clear disturbances in menstrual cadence during early childbearing years serve as a reliable clinical predictor for an underlying diagnosis of PCOS.

The findings demonstrate a significant difference in confirmed cases between the adolescent group and the young adult group (40.4% vs 59.6%). This variation is likely due to the strictness of the international evidence-based guidelines applied to the 15–19 age group, which demand the simultaneous presence of anovulatory cycle irregularities and hyperandrogenism, while explicitly excluding ultrasound assessment.[8] This careful diagnostic framework prevents the over-diagnosis of adolescents who may experience transient, physiological anovulation during the early years post-menarche. By young adulthood (20–24 years), the endocrine phenotype stabilizes, making clinical manifestations clearer and more readily classifiable under the Rotterdam framework.[20-23,26]

A notable finding from this study is the marked divergence between clinical signs of hyperandrogenism and biochemical data. While hirsutism and severe acne affected 48.9% and 36.7% of the total cohort, respectively, elevated serum free testosterone was documented in only 5.0% of participants. This finding is consistent with standard clinical consensus positions, such as those by the Endocrine Society, which note that routine direct analog testosterone assays often lack the sensitivity needed to detect low-level elevations in moderately androgenized female patients.[28] Consequently, normal androgen levels do not rule out the syndrome, and thorough physical evaluations like the modified Ferriman-Gallwey score remain essential for clinical diagnosis in this population.

The metabolic profile of this cohort is closely tied to weight parameters. The mean BMI was significantly higher in the PCOS group (24.17 kg/m^2) than in the non-PCOS group (22.20 kg/m2, p=0.020). Obesity and elevated body mass can worsen the clinical course of PCOS by aggravating underlying insulin resistance which increases ovarian androgen synthesis and suppresses hepatic sex hormone-binding globulin (SHBG) production.[17,21] However, it is important to note that over half (56.11%) of the total study population maintained a normal BMI, with only 6.11% meeting the criteria for frank clinical obesity. This finding demonstrates that a lean or normal-weight phenotype is common among young South Asian women with PCOS, where visceral adiposity may occur without marked systemic obesity.[15]

Additionally, this study demonstrated a statistically significant elevation in mean serum TSH levels within the PCOS cohort compared to non-PCOS controls (2.78 vs 2.23mIU/l, p=0.040) alongside significantly elevated LH (9.38 vs.8.24IU/l, p=0.041). This finding is consistent with literature linking upper-normal TSH levels (>2.5mIU/l) to the hyperandrogenic PCOS phenotype, even within euthyroid ranges.[29] This underscores the value of testing TSH both to rule out primary thyroid disorders and to monitor for subclinical hypothyroidism, which can worsen ovulatory dysfunction.

Limitations

This study was conducted using a convenience sample at a single tertiary care centre, which may limit the generalizability of the findings to the broader community. Because transabdominal ultrasonography was utilized uniformly to respect patient preferences, the lower

resolution of this approach compared to transvaginal scanning may have underestimated the presence of PCOM in the adult group. Finally, as a cross-sectional study, this work could not track the progression of symptoms or evaluate long-term metabolic outcomes over time.

CONCLUSION

This study demonstrates a high frequency of PCOS (63.3%) among young women seeking medical care for menstrual irregularities at a tertiary centre in South India. The prominent presentation of clinical signs of hyperandrogenism, contrasted with low rates of biochemical hyperandrogenaemia, highlights the value of standardized clinical tracking methods like the modified Ferriman-Gallwey score for reliable screening. The significant differences in BMI, LH, and TSH levels between the study groups emphasize that managing menstrual irregularities in young women requires more than regularizing cycles; it demands early risk screening and metabolic monitoring.

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