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Original Research Article

Prevalence and Associated Risk Factors of PCOS Among Reproductive-Aged Women

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Abstract:

Background: Polycystic Ovary Syndrome (PCOS) is a common endocrine disorder in reproductive-aged women, associated with menstrual, hormonal, and metabolic abnormalities.

Objective: To estimate the prevalence of polycystic ovary syndrome (PCOS) among reproductive-aged women in educational institutions across Bihar, India, and to examine its associated anthropometric, metabolic, and hormonal risk factors.

Methods: A cross-sectional study was conducted from 8 months among 1500 women aged 15–40 years in educational institutions of Bihar using multistage random sampling. Initial screening assessed menstrual irregularities and hyperandrogenic symptoms. Probable PCOS cases underwent clinical, biochemical, hormonal, and ultrasonographic evaluation. Diagnosis was based on Rotterdam 2003 criteria, with NIH and AE-PCOS criteria applied for comparison. Anthropometric, metabolic, and hormonal parameters were recorded.

Results: Of 1500 women screened, 696 (46.4%) were probable PCOS, and 266 completed full evaluation. PCOS prevalence was 36.0% by Rotterdam, 29.5% by NIH, and 33.7% by AE-PCOS criteria, highest in the 20–24 years age group. The classic phenotype (oligomenorrhea + hyperandrogenism + polycystic ovarian morphology) was most common (52.6%). Women with PCOS had higher Ferriman–Gallwey scores, elevated LDL, reduced HDL, and impaired glucose tolerance compared to controls.

Conclusion: PCOS is highly prevalent among young women in Bihar, especially in early reproductive years. Early screening, awareness programs, and lifestyle interventions are crucial to prevent long-term reproductive and metabolic complications. Multicentric studies are needed to establish population-specific diagnostic and preventive strategies.

Keywords: Androgen Excess, Ferriman–Gallwey Score, Polycystic Ovary Syndrome, Prevalence, Reproductive-aged Women, Rotterdam Criteria.

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Introduction

Polycystic Ovary Syndrome (PCOS) is a complex endocrine and metabolic disorder affecting women predominantly in their reproductive years and is recognized as one of the leading causes of anovulatory infertility worldwide [1]. It is clinically manifested through a combination of menstrual irregularities, clinical or biochemical hyperandrogenism, and polycystic ovarian morphology (PCOM). Along with reproductive dysfunction, PCOS is strongly associated with obesity, insulin resistance, dyslipidemia, type 2 diabetes mellitus, hypertension, and cardiovascular morbidities, making it a multidimensional health condition that extends beyond the reproductive axis [2].

The global prevalence of PCOS varies significantly, ranging between 4% and 20%, depending on the population studied and the diagnostic criteria applied. The three widely used international diagnostic criteria National Institutes of Health (NIH), Rotterdam, and Androgen Excess & PCOS Society (AE-PCOS) differ in their emphasis on phenotypic features, resulting in varied prevalence estimates. Additionally, lifestyle transitions, sedentary habits, increasing stress levels, environmental endocrine disruptors, and dietary changes in developing countries such as India contribute to a rising burden of PCOS [3].

Ethnic and geographic diversity further influences the clinical presentation and metabolic severity of PCOS, highlighting the need for region-specific epidemiological research [4]. In India, community-based studies on PCOS remain limited, with most available research focusing on adolescents or hospital-based samples, which may not accurately represent the broader population [5]. This gap in evidence underscores the importance of conducting population-level studies to capture the true prevalence and risk factors of PCOS across diverse settings [6]. Early detection of PCOS is particularly critical, as delayed diagnosis can accelerate the onset of metabolic complications, including insulin resistance, dyslipidemia, and type 2 diabetes, while also adversely affecting psychological well-being. Women with undiagnosed or untreated PCOS may experience depression, anxiety, low self-esteem, and a reduced quality of life, further emphasizing the need for timely identification and intervention strategies tailored to the local population [7].

Understanding the prevalence of polycystic ovary syndrome (PCOS) and its associated risk factors in reproductive-aged women is essential for effective public health planning. Such knowledge enables healthcare providers to design targeted awareness campaigns, implement lifestyle modification interventions, and develop accurate diagnostic strategies to prevent long-term complications, including metabolic disorders, infertility, and cardiovascular risks [8]. Accordingly, the present community-based study aims to estimate the prevalence of PCOS using standardized clinical, biochemical, and ultrasonographic criteria, and to examine its association with key risk factors such as obesity, family history, and lifestyle patterns among women aged 15–40 years. By generating comprehensive epidemiological data within the Indian context, this study will provide valuable insights into the distribution and determinants of PCOS across different subgroups [9].

The findings will support the development of ethnicity-specific diagnostic approaches and preventive measures, ultimately helping to reduce the future health burden of PCOS in the Indian female population and improve overall reproductive and metabolic health outcomes.

Methodology

Study Design: The present study was a community-based, cross-sectional prevalence study designed to assess Polycystic Ovary Syndrome (PCOS) among reproductive-aged women.

Study Area: The study was conducted in the Department of Obstetrics & Gynecology, Nalanda Medical College and Hospital (NMCH), Patna, Bihar, India for 8 months from March 2025 to October 2025

Study Population: The study population comprised women aged 15–40 years enrolled in the randomly selected educational institutions across the study area. Only those who met the eligibility criteria and provided informed consent were included in the study.

Selection Criteria

Inclusion Criteria

- Women aged 15–40 years
- Willingly provided written informed consent
- Ready for complete clinical and laboratory assessment

Exclusion Criteria

- Known cases of chronic systemic/endocrine disorders
- Currently using hormonal therapy or oral contraceptives
- Pregnancy and lactation

Sample Size and Sampling Technique: A total of 1500 eligible women were recruited for the study using a multistage random sampling approach to ensure adequate representation of the target population. In the first stage, districts from Bihar were randomly selected, followed by the random selection of educational institutions within these districts. In the final stage, all eligible and consenting women enrolled in the selected institutions were included through a universal sampling approach.

Data Collection Procedure: Data collection was conducted by trained field investigators through a staged approach. Initially, participants underwent a screening interview using a pre-tested structured questionnaire to obtain detailed information on menstrual cycle patterns, symptoms of hyperandrogenism such as hirsutism, acne, or alopecia, and any relevant past medical history or medication use. This preliminary screening helped in identifying women with possible manifestations of PCOS for further clinical and laboratory evaluation.

Clinical Examination: A comprehensive general physical and systemic examination was conducted for each participant, which included measurement of height, weight, body mass index (BMI), waist and hip circumference, and blood pressure. Hirsutism was evaluated using the modified Ferriman–Gallwey scoring system by examining terminal hair growth over nine specific body regions. A cumulative score of ≥ 8 was considered indicative of clinical hirsutism.

Laboratory Investigations: All clinically probable PCOS women were subjected to a comprehensive series of biochemical and endocrine laboratory evaluations to assess glucose metabolism, lipid status, hormonal imbalance, and organ function.

- **Oral Glucose Tolerance Test (OGTT):** OGTT was performed after 10–12 hours overnight fasting. A baseline blood sample (0 min) was collected, followed by ingestion of 75 g anhydrous glucose. Blood glucose levels were measured at 60 and 120 minutes to assess glucose tolerance and insulin resistance.
- **Biochemical Parameters:** Biochemical analysis included lipid profile (TC, LDL-C, HDL-C, TG), liver function markers (ALT, AST, ALP, bilirubin), and renal parameters (creatinine, BUN, uric acid) to determine cardiometabolic risks commonly associated with PCOS.
- **Hormonal Profile:** Blood samples (10 mL) were collected on Day 2–7 of a natural or progesterone-induced cycle for measurement of serum total testosterone, LH, FSH, TSH, T4, prolactin, 17-OHP, and cortisol. Serum was stored at −80°C until analysis. Hyperandrogenemia was defined as total testosterone > 65 ng/dL.

Ultrasonographic Examination: Pelvic ultrasonography, either transabdominal or transvaginal depending on the participant's marital status and clinical feasibility, was performed to assess ovarian morphology. The presence of polycystic ovarian morphology was determined as per Rotterdam criteria, based on ovarian volume and follicle count in one or both ovaries.

Diagnostic Criteria: PCOS diagnosis was established using the Rotterdam 2003 criteria and further evaluated as per NIH and AE-PCOS guidelines. Participants fulfilling the respective clinical, hormonal, and sonographic requirements were classified as confirmed PCOS cases.

Laboratory and Instrumentation Details (for Methodology): Plasma glucose, lipid profile, liver function markers (ALP), calcium, and phosphorus were estimated using a fully automated chemistry analyzer with standard commercial kits. Hormonal assays including serum total T4, total testosterone, 17-OHP, cortisol, TSH, prolactin, LH, and FSH were performed by chemiluminescent immunoassay using an automated immunoassay platform. Pelvic ultrasound evaluation was conducted by a trained radiologist using a 3-MHz transabdominal transducer between Day 2–7 of the menstrual cycle. Polycystic ovarian morphology was defined as ≥12 follicles measuring 2–9 mm and/or ovarian volume >10 mL in one or both ovaries as per Rotterdam criteria.

Statistical Analysis: Data was entered, coded, and analyzed using standard statistical software. Descriptive statistics were used to summarize participant characteristics, while PCOS prevalence was calculated as per the diagnostic criteria applied. Chi-square test was used to assess associations between variables, with a p-value < 0.05 considered statistically significant.

Result

A total of 1500 eligible women attending the Outpatient Department of Obstetrics and Gynecology, Nalanda Medical College & Hospital, Patna, Bihar, were screened for symptoms suggestive of PCOS. Based on menstrual irregularity and/or clinical hyperandrogenism, 696 (46.4%) women were identified as "probable PCOS", while 804 (53.6%) were considered as controls. Among the probable cases, 572 (82.1%) exhibited hirsutism, 394 (56.5%) had menstrual irregularities, and 277 (39.7%) presented with both hirsutism and menstrual irregularity.

Of the 1500 women screened, 652 (43.4%) attended the hospital for further evaluation, including 340 probable PCOS and 312 controls. Among the probable cases, 299 underwent pelvic ultrasonography whereas 266 completed both biochemical and hormonal investigations. In these 266 women, elevated serum prolactin was observed in two cases, and three women were identified with primary hypothyroidism. Additionally, six women exhibited isolated ovulatory dysfunction, eight had idiopathic hyperandrogenemia, and 21 showed idiopathic hirsutism. Among the control group, 197 women completed biochemical evaluation.

Table 1: Age-wise Prevalence of PCOS by Different Diagnostic Criteria

Age Groups (years)	NIH (%)	Rotterdam (%)	AE-PCOS (%)
15–19	18.06	20.06	19.31
20–24	42.51	51.41	50.41
25–29	36.22	43.46	42.56
30–40	9.87	14.81	13.82

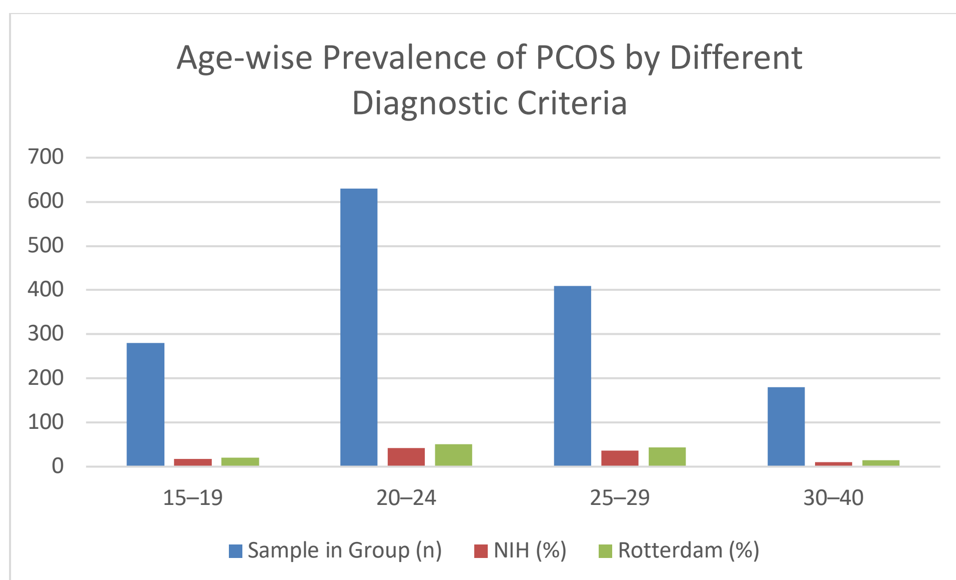

Figure 1: Prevalence of PCOS in different age groups.

Table 2: Comparison of Anthropometric & Laboratory Parameters

Parameter	Definite PCOS (n=261) Mean ± SD	Controls (n=196) Mean ± SD	p-value
Age (years)	24.20 ± 4.50	24.80 ± 4.40	0.142
Age at Menarche (years)	12.90 ± 1.50	13.10 ± 1.70	0.28
Cycles per year	9.10 ± 3.60	11.90 ± 0.40	<0.001***
Ferriman–Gallwey Score	11.10 ± 3.80	6.40 ± 1.10	<0.001***
Height (cm)	157.30 ± 5.50	157.40 ± 5.10	0.91
Weight (kg)	58.10 ± 10.20	56.40 ± 10.10	0.19
BMI (kg/m²)	23.50 ± 3.95	22.70 ± 3.90	0.2
Waist (cm)	82.10 ± 9.10	82.70 ± 10.00	0.62
Hip (cm)	90.40 ± 6.90	91.50 ± 8.00	0.23
SBP (mmHg)	113.00 ± 11.10	114.50 ± 9.30	0.18
DBP (mmHg)	76.30 ± 8.80	76.10 ± 7.80	0.9
Serum Total Cholesterol (mg/dL)	165.20 ± 30.50	163.10 ± 31.60	0.5
Serum Triglycerides (mg/dL)	123.50 ± 52.20	119.20 ± 45.90	0.42
Serum HDL (mg/dL)	42.80 ± 11.00	50.30 ± 20.70	0.048*
Serum LDL (mg/dL)	104.50 ± 25.30	92.70 ± 30.10	0.006**
Fasting Glucose (mg/dL)	85.10 ± 10.90	84.90 ± 10.60	0.91
1-hr Plasma Glucose (mg/dL)	115.20 ± 38.40	104.30 ± 23.90	0.015*
2-hr Plasma Glucose (mg/dL)	99.80 ± 33.00	93.40 ± 24.10	0.040*
Serum LH (IU/L)	8.30 ± 5.00	7.40 ± 4.90	0.16
Serum FSH (IU/L)	58.10 ± 41.30	29.50 ± 7.40	<0.001***

Based on the Rotterdam 2003 criteria, 261 women were confirmed to have PCOS and were categorized into four phenotypes. The most common phenotype was Group 1 (oligomenorrhea + hyperandrogenism + PCOM), comprising 137 women (52.6%). Group 2 (oligomenorrhea + hyperandrogenism) and Group 3 (hyperandrogenism + PCOM) each included 58 women (22.1% and 22.3%, respectively). The least prevalent was Group 4 (oligomenorrhea + PCOM), observed in 8 women (3.0%). These findings indicate that the classical phenotype remains the dominant PCOS presentation in this study population.

Discussion

Globally, the prevalence of PCOS has been reported to range between 4.0% in the USA, 8.5% in Brazil, 16.6% in Denmark, and 19.9% in Turkey. Variations across regions may be attributed to differences in diagnostic criteria, ethnicity, healthcare access, and lifestyle patterns. Recent studies in Asian populations have shown PCOS prevalence rates of 7–14% depending on whether NIH or Rotterdam criteria were used, further confirming significant geographical disparity.

In the present study conducted among the burden15–40 years from educational institutions across Bihar,

Ashraf et al., (2025) revealed that the prevalence of probable PCOS was found to be 52.1%, based on a combination of menstrual irregularities and clinical signs of hyperandrogenism and Liu et al., (2021) observed that the burden is considerably higher than several previous studies conducted in Asian communities [11]. Such heightened rates in our population could reflect lifestyle transitions influenced by urbanization, changing dietary patterns, stress, and declining physical activity among young women.

Sanjana et al., (2017) demonstrated that highest prevalence was noted in the early reproductive years, particularly among women in the 20–24 years age group, suggesting earlier onset of reproductive disturbances [12]. Wu et al., (2022) observed that the Prevalence gradually declined with advancing age, which may be explained by progressive stabilization of the hypothalamic-pituitary-ovarian axis with age. A similar age-related decline has also been reported in other international studies [13].

According to Tatarchuk et al., (2024) Phenotypic characterization according to the Rotterdam criteria revealed that the classic phenotype (oligomenorrhea + hyperandrogenism + PCOM) was the most commonly present clinical form of PCOS in this study population, whereas non-hyperandrogenic PCOS phenotype was the least observed [14]. This predominance of androgen-excess phenotypes highlights the central role of hyperandrogenism in disease expression among women of this region.

Creed et all., (2917) recognized the potential reasons behind a relatively higher prevalence in the present findings [15]. While Blodt et al., (2017) revealed that Since participation in this study was voluntary and included women reporting menstrual or dermatological concerns, symptomatic women may have been overrepresented, thereby reflecting the upper range of PCOS burden in the community [16]. Additionally, the selected study setting—academic institutions—may include more health-aware young women seeking early medical attention.

Dolleman et al., (2013) says that the strength of this study lies in evaluating women across a wide reproductive age range (15–40 years) and conducting clinical, hormonal, and ultrasound-based assessments for improved diagnostic accuracy [17]. However, the cross-sectional design limits causal inference, and further multicentric surveys involving community-based sampling are warranted to establish state-level and national prevalence estimates with greater precision [18].

Overall, the findings reflect a concerningly high burden of PCOS in young women of Bihar, emphasizing the need for targeted screening programs, awareness campaigns, and preventive lifestyle interventions to mitigate future reproductive and metabolic complications associated with this syndrome.

Conclusion

The present cross-sectional pilot study among female students demonstrated that the prevalence of PCOS was 28.9% according to NIH criteria, 35.3% by Rotterdam criteria, and 34.3% using AE-PCOS guidelines, indicating a comparatively higher burden than previously reported in several Asian populations. The variation in prevalence across different diagnostic criteria reflects the complexity and heterogeneity of PCOS. These differences may also be influenced by geographic, ethnic, lifestyle, and environmental factors. Given the high proportion of probable PCOS and associated metabolic risk indicators observed in this study, there is an urgent need for early screening in young women. Furthermore, large-scale, multicentric studies are essential to establish ethnicity-specific diagnostic recommendations, reduce misdiagnosis, and facilitate timely clinical management of this multifactorial disorder.

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