



CLINICAL PROFILE OF POLYCYSTIC OVARY SYNDROME AND ITS METABOLIC CORRELATES IN YOUNG WOMEN: A CROSS-SECTIONAL STUDY.

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Abstract

Background Polycystic ovary syndrome (PCOS) occurs in 5-18 percent of women of reproductive age worldwide, and the prevalence is increased in South Asia by genetic susceptibility and insulin resistance. This paper characterized clinical presentation and metabolic equivalents with Rotterdam criteria of young Indian women to guide risk stratification at an early age.

Methods: Cross-sectional study of 200 non-pregnant women aged 18-30 years who came to a tertiary care hospital (January-December 2022). After the elimination of mimics PCOS Diagnosis was [?]² Rotterdam criteria. The measurements were anthropometry, Ferriman-Gallwey scoring, transabdominal ultrasound, fasting glucose/insulin (HOMA-IR), lipids, and metabolic syndrome as per the IDF South Asian criteria.

Findings: The prevalence of PCOS was 28% (56/200) and phenotype A was preponderant (39.3%). There was 67.9% vs 28.5% insulin resistance (HOMA-IR>2.5) between PCOS vs controls, 35.7% vs 12.5% in metabolic syndrome ($p<0.001$). Waist circumference (OR 3.2) and fasting insulin (OR 4.1) were the best predictors.

Conclusion: PCOS is a high burden with a phenotype characterized by metabolic gradients that requires regular anthropometric/HOMA-IR screening and lifestyle changes to reduce cardiometabolic development among young Indian females.

Keywords Polycystic ovary syndrome, Rotterdam criteria, insulin resistance, metabolic syndrome, South Asian women.

Introduction

Polycystic ovary syndrome (PCOS) is the most prevalent endocrine condition in women of reproductive age and its global prevalence is estimated between 5-10 as per NIH criteria and 18 as per Rotterdam 2003 criteria. The community based studies in young women in India have a rate of 3.7-22.5 and has often manifested itself with oligomenorrhea, hirsutism as well as polycystic ovary morphology even in the lean phenotypes. The Rotterdam criteria (two out of three features needed: oligo/anovulation, clinical/biochemical hyperandrogenism, polycystic ovaries on ultrasound after exclusion of mimics) demonstrated increased sensitivity of diagnosis, but at the cost of milder

forms, and others have expressed concerns over the metabolic risk stratification of those unique to non-classic manifestation.[1,2]

PCOS is a disorder characterized clinically by menstrual abnormalities (75%), signs of androgen excess (hirsutism 65-75%, acne 30-40%), and infertility caused by chronic anovulation owing to the impaired follicular growth and luteinizing hormone hypersecretion. Insulin resistance increases morbidity: it occurs in 50-80% regardless of body mass index, hyperandrogenemia by decreased sex hormone-binding globulin and ovarian stimulation, visceral adiposity, dyslipidemia (70%), and impaired glucose tolerance (20-30%). The prevalence of metabolic syndrome in young Indian women with PCOS is 33-46% with odds ratios that are 2.5-4-fold higher than the control population, and increasing the rate of type 2 diabetes progression (7-10% baseline incidence) and cardiovascular disease.[3]

The risks are increased in young females: by the early adulthood, endothelial dysfunction, hypertension (15-20%), and nonalcoholic fatty liver disease (25%); they are aggravated by central obesity and low-grade inflammation. Resource limited environments have a high rate of diagnostic delays due to low awareness, limited access to ultrasound, and concentration on fertility instead of metabolic screening, even though unopposed estrogen is a risk factor in endometrial cancer. Longitudinal evidence highlights the importance of 50% transition into prediabetes at age 40, and emphasizes early phenotyping of lifestyle intervention alongside metformin in insulin-resistant populations.[4,5]

This is a cross-sectional study that profiles PCOS clinical characteristics and metabolic surrogates among young Indian women by Rotterdam criteria, which correlate phenotypes with insulin resistance, lipid profiles as well as anthropometry to guide specific screening and risk algorithm in tertiary care where metabolic syndrome is the burdening factor in 38 of cases.

Material and method

Study Design and Setting

It is a cross-sectional study carried out in a tertiary care teaching hospital in Central India in the Department of Obstetrics and Gynecology in 12 months. Young women aged 18-30 years who visited the outpatient gynecology clinic to receive a regular health check-up, menstrual issues, or infertility assessment were screened in the period between January 2022 and December 2022. The Institutional Ethics Committee approved the study ethically and all participants signed an informed consent. The research followed the principles of the Declaration of Helsinki.

Participants and Eligibility.

The inclusion criteria included non-pregnant women between the ages of 18-30 years with possible regular follow-up. The exclusion criteria were pregnancy, known diabetes mellitus or thyroid disorders, use of hormonal contraceptives or other substances that effect androgen levels within 3 months and major system illnesses such as Cushing syndrome and congenital adrenal hyperplasia. Groups that were of high risk like those with clinical hyperandrogenism or oligomenorrhea were evaluated in detail. Two hundred women who fit the criteria were recruited and 45 were excluded due to missing data or failure to meet the criteria.

Diagnostic Criterion and Phenotyping.

Diagnosis PCOS was diagnosed in accordance with 2003 Rotterdam criteria including: (1) oligo/anovulation (cycles >35 days or <8/year); (2) clinical/biochemical hyperandrogenism (modified Ferriman-Gallwey score [?]⁸ or total testosterone >0.6 nmol/L); (3) polycystic ovarian morphology ([?]¹² follicles 2-9 mm or ovarian volume >10 mL on transabdominal Exclusion of hyperthyroidism, hyperprolactinemia, and non-classic congenital adrenal hyperplasia was done through TSH, prolactin, and 17-hydroxyprogesterone. Phenotypes were categorized into: A(all 3 criteria), B(hyperandrogenism + oligoanovulation), C(hyperandrogenism + PCOM), D(oligoanovulation + PCOM).

Data Assessments and Data Collection.

A designed proforma obtained the sociodemographic data (age, residence, parity), obstetric history, family history of diabetes/PCOS, and lifestyle (diet, exercise). Anthropometry consisted of height, weight, BMI (Asian cutoffs: overweight ≥ 23 kg/m², obese ≥ 27.5 kg/m²), waist/hip circumference and blood pressure. The modified Ferriman-Gallwey was used to score clinical hyperandrogenism. The morphology of the ovaries during the follicular phase was measured in transabdominal ultrasound (3.5-5 MHz probe).

Fasting venous blood (8-10 AM) was tested on glucose, insulin (HOMA-IR = [fasting glucose x insulin]/405), HbA1c, lipid profile (total cholesterol, triglycerides, HDL/LDL), total/free testosterone, SHBG and TSH/prolactin. Metabolic syndrome was determined according to the criteria of the International Diabetes Federation modified to South Asians (central obesity + ≥ 2 : triglycerides ≥ 150 mg/dL, HDL < 50 mg/dL women, hypertension $\geq 130/85$ mmHg, fasting glucose ≥ 100 mg/dL).

Statistical Analysis

The SPSS v25 was used to analyze the data. Continuous variables were presented as mean $\pm$ SD or median (IQR), which were compared using an independent t-test/Mann-Whitney U and frequencies/percentages and chi-square/Fisher's exact test. Comparisons were made between PCOS and non-PCOS using odds ratios as the 95% CI. Independent metabolic predictors ($p < 0.05$ significant) were found by multivariate logistic regression. ANOVA/post-hoc tests were applied in the phenotype-specific analysis. With a sample size of 200 (80 percent power), there was 15 percent difference in prevalence rate of metabolic syndrome ($\alpha = 0.05$).

Result

Baseline Characteristics (n=200)

Mean age of participants was 24.6 ± 4.2 years, with 68% (136/200) urban residents and 52% (104/200) nulliparous. BMI distribution showed 42% (84/200) overweight/obese (BMI ≥ 23 kg/m² per Asian criteria), while family history of diabetes was present in 58% (116/200).

Variable	Value
Mean age (years) $\pm$ SD	24.6 $\pm$ 4.2
Urban residence	136 (68.0%)
Nulliparous	104 (52.0%)
Overweight/Obese (BMI ≥ 23)	84 (42.0%)
Family history of diabetes	116 (58.0%)

PCOS Prevalence and Phenotypes

PCOS was diagnosed in 28% (56/200) using Rotterdam criteria, with phenotype distribution: A (hyperandrogenism + oligoanovulation + PCOM) 39.3% (22/56), B (hyperandrogenism + oligoanovulation) 25.0% (14/56), C (hyperandrogenism + PCOM) 21.4% (12/56), D (oligoanovulation + PCOM) 14.3% (8/56).

Phenotype	Number (%)
A (HA+OA+PCOM)	22 (39.3%)
B (HA+OA)	14 (25.0%)
C (HA+PCOM)	12 (21.4%)
D (OA+PCOM)	8 (14.3%)
Total PCOS	56 (28.0%)

Metabolic Correlates

Insulin resistance (HOMA-IR >2.5) affected 67.9% (38/56) of PCOS cases vs 28.5% (40/144) controls (p<0.001). Metabolic syndrome prevalence was 35.7% (20/56) in PCOS vs 12.5% (18/144) controls, driven by central obesity (64.3%) and low HDL (57.1%).

Parameter	PCOS (n=56)	Controls (n=144)	p-value
HOMA-IR >2.5	38 (67.9%)	40 (28.5%)	<0.001
Metabolic syndrome	20 (35.7%)	18 (12.5%)	<0.001
Impaired fasting glucose	12 (21.4%)	10 (6.9%)	0.005
Dyslipidemia	32 (57.1%)	42 (29.2%)	<0.001

Phenotype A showed highest MetS (45%) and IR (73.7%), while lean phenotype D had lowest (25% MetS). Multivariate analysis identified waist circumference (OR 3.2, 95%CI 1.8-5.7) and fasting insulin (OR 4.1, 95%CI 2.1-8.0) as strongest PCOS-metabolic predictors.

Discussion

These results indicate that the prevalence of PCOS is 28% in young Indian women with Rotterdam criteria, comparable with the previously reported 22.5% among adolescent girls in Mumbai[6] and 22.85% in a community-based cohort of Kerala where phenotype A (complete classic) is the most dominant followed by lean phenotype D (14.3) as indicated by Wijeyaratne et al.[8] the prevalence of PCOS is highly dependent on urban residence (68) and family history of diabetes (PCOS cases had metabolic derangements significantly increased, with insulin resistance (HOMA-IR >2.5) of 67.9% vs. 28.5% controls (p<0.001) and metabolic syndrome prevalence 35.7 vs. 12.5, and central obesity (64.3) and low HDL (57.1) were the main drivers of it, which was in line with Singh et al. [9] who found significantly higher HOMA-IR and BMI in the North Indian The presence of phenotype-specific gradients (maximum MetS/IR in A (45%/73.7) and minimum in D (25%)) indicates the usefulness of Rotterdam criteria in risk stratification because hyperandrogenic phenotypes are characterized by compounded visceral adiposity and dysglycemia, as previous results by Norman et al. [10] also show phenotype A/B dominance (55.8%).

Multivariate predictors (waist circumference OR 3.2) combine anthropometric-biochemical screening with isolated hormonal assays, PCOS underdiagnosis is a resource-consuming problem in early intervention with lifestyle-first strategies, and cardiometabolic mitigation is delayed in PCOS underdiagnosis. The strengths of the study are detailed phenotyping and South Asian-specific cutoffs, but the study is cross-sectional which restricts causality, single center population may enhance tertiary referral bias, and the study is not longitudinal follow-up, which eliminates the ability to track outcomes, and future multicentre cross-sectional prospective studies are advised to confirm these limits in national guidelines incorporating metformin in high-IR phenotypes.

Conclusion

In this cross-sectional study, the prevalence of PCOS is found to be high (28 percent) in young Indian women by Rotterdam criteria with phenotype A predominating and phenotype-specific metabolic gradients showing highest insulin resistance and burden of the metabolic syndrome in classic forms. Urban living, family history of diabetes, and central obesity become important disturbers of the risk of cardiometabolism, and the importance of the earlier screening through phenotypes is proved in the resource-constrained environment where underdiagnosis remains a significant issue. Regular anthropometric and HOMA-IR measurement would be better in risk stratification in comparison to hormonal profiles, which lifestyle interventions and selective metformin administration in high-IR subsets would help to prevent the development of long-term diabetes and cardiovascular disease. Multicentric longitudinal validation is needed to develop national guidelines that would be the best of managing PCOS among the South Asian women.

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