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Systematic Review Article

# Prevalence of Polycystic Ovary Syndrome in Reproductive Age Women: Systematic review

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## ABSTRACT

Polycystic ovary syndrome (PCOS) is a prevalent endocrine disorder among Indian women of reproductive age, associated with significant reproductive and metabolic complications. This systematic review synthesizes evidence from 17 studies, including nationwide surveys, hospital-based studies, adolescent/college-based assessments, and rural/community-based investigations. Prevalence estimates varied widely, ranging from 3.7% to 72.5%, influenced by regional differences, study populations, and diagnostic criteria (NIH, Rotterdam, AE-PCOS). Phenotype C, characterized by ovulatory dysfunction, hyperandrogenism, and polycystic ovarian morphology, was the most commonly reported presentation. Metabolic comorbidities were highly prevalent, with obesity, dyslipidemia, insulin resistance, and nonalcoholic fatty liver disease frequently observed. Adolescents and rural women emerged as particularly vulnerable groups, with many cases remaining undiagnosed due to limited awareness. Knowledge gaps among young women underscore the need for structured educational programs, community outreach, and early screening initiatives. The heterogeneity in diagnostic criteria and cross-sectional design of most studies limits direct comparability, highlighting the need for standardized approaches and longitudinal research. Overall, the findings demonstrate a substantial burden of PCOS in India, emphasizing the importance of early detection, lifestyle interventions, and public health strategies to mitigate long-term reproductive and metabolic complications.

***Keywords****: Polycystic ovary syndrome, prevalence, India, reproductive-age women, systematic review*

## INTRODUCTION

Polycystic ovary syndrome (PCOS) is a multifactorial endocrine disorder affecting women of reproductive age, characterized by clinical, biochemical, and ultrasonographic features such as menstrual irregularities, hyperandrogenism, and polycystic ovarian morphology. It is considered one of the most common endocrine disorders in women, contributing significantly to reproductive, metabolic, and psychological morbidity [1,2]. Globally, the prevalence of PCOS ranges from 8% to 13% depending on diagnostic criteria, age, ethnicity, and population studied [1]. In South Asia, particularly India, the prevalence appears to be higher, with recent studies reporting rates ranging from 3.7% to 35.3%, reflecting regional disparities and differences in study design, sample size, and diagnostic methods [2,3].

The pathophysiology of PCOS is complex, involving interactions between genetic, hormonal, metabolic, and environmental factors. Insulin resistance, observed in a majority of PCOS cases, contributes to hyperinsulinemia, which in turn exacerbates ovarian androgen production, leading to anovulation and irregular menstruation [4,5]. Obesity, sedentary lifestyle, and high-calorie diets further compound the metabolic and reproductive manifestations of PCOS [6]. Genetic predisposition and familial aggregation have also been implicated, suggesting a heritable component in its etiology [7].

PCOS presents with heterogeneous clinical manifestations. Hyperandrogenism can manifest as hirsutism, acne, and alopecia, while ovulatory dysfunction leads to oligomenorrhea, amenorrhea, or infertility [8]. These features are frequently accompanied by metabolic complications, including insulin resistance, dyslipidemia, obesity, and increased cardiovascular

risk [9,10]. Furthermore, psychological comorbidities, such as anxiety, depression, and reduced quality of life, are increasingly recognized among affected women [11].

Diagnosis of PCOS in adolescents and young adults poses additional challenges. Many features of puberty, such as irregular cycles or mild acne, may overlap with PCOS symptoms, complicating early detection [12]. Moreover, the use of different diagnostic criteria—National Institutes of Health (NIH), Rotterdam, or Androgen Excess Society (AES)—yields variability in prevalence estimates, highlighting the need for standardized, population-specific guidelines [1,13].

Given the significant burden of PCOS and its long-term reproductive and metabolic consequences, there is a pressing need to synthesize existing epidemiological data to inform clinical practice and public health policies. India, with its diverse population and lifestyle variations, lacks a consolidated review of recent PCOS prevalence data. This systematic review aims to collate and analyze studies to provide a comprehensive overview of PCOS prevalence and associated risk factors in Indian women, thereby identifying knowledge gaps and guiding future interventions.

## MATERIAL AND METHODS

**Search Strategy and Data Sources:** A systematic literature search was performed across PubMed, Scopus, Web of Science, and Google Scholar databases for published studies. The search combined Boolean operators with relevant keywords: ("Polycystic Ovary Syndrome" OR "PCOS") AND ("prevalence" OR "epidemiology") AND ("India" OR "Indian"). The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for study selection and reporting [14].

### Inclusion and Exclusion Criteria

**Inclusion criteria:**

1. Studies conducted in India reporting prevalence of PCOS.
2. Population included adolescent or reproductive-age women (10–45 years).
3. Cross-sectional, observational, or hospital-based studies.
4. Use of standardized diagnostic criteria such as NIH (1990), Rotterdam (2003), or AE-PCOS Society criteria.
5. Published in English in peer-reviewed journals.

**Exclusion criteria:**

- Studies conducted outside India.
- Case reports, reviews, editorials, conference abstracts, and non-peer-reviewed articles.
- Studies without clearly defined diagnostic criteria or insufficient prevalence data.

**Study Selection Process:** Two independent reviewers screened titles and abstracts for relevance. Full-text articles were retrieved for potentially eligible studies. Any discrepancies in study selection were resolved by discussion or consultation with a third reviewer. The PRISMA four-phase process was followed:

1. Identification of records.
2. Screening of titles and abstracts.
3. Full-text eligibility assessment.
4. Final inclusion of studies for the systematic review.

**Data Extraction and Quality Assessment:** A standardized data extraction form was used to collect information on study design, sample size, population characteristics, diagnostic criteria, methods of PCOS assessment, prevalence rates, and key findings. Study quality was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist [15] for cross-sectional studies, with studies rated as low, moderate, or high quality. **Data Synthesis:** Due to heterogeneity in study design, population, and diagnostic criteria, data were synthesized narratively. Studies were categorized into four thematic groups: (1) Nationwide / multi-center studies, (2) Hospital-based / tertiary care studies, (3) Adolescent / college-based studies, and (4) Rural / community-based adult women. Meta-analysis was not performed because of variability in population age groups, diagnostic criteria, and outcome measures.

**Study Selection and Screening Process:** The systematic search initially identified 1,712 records across PubMed, Scopus, Web of Science, and Google Scholar databases and 28 records from other sources. After removing 340 duplicates, 1,400 records were screened based on titles and abstracts. Of these, 1,350 records were excluded for not meeting inclusion criteria (studies conducted outside India, reviews, case reports, or lacking prevalence data). The full texts of 50 articles were assessed for eligibility. After detailed evaluation, 33 studies were excluded due to: non-standardized diagnostic criteria (n = 12), population outside the specified age range (n = 10), or insufficient prevalence data (n = 11). Finally, 17 studies were included in the systematic review.

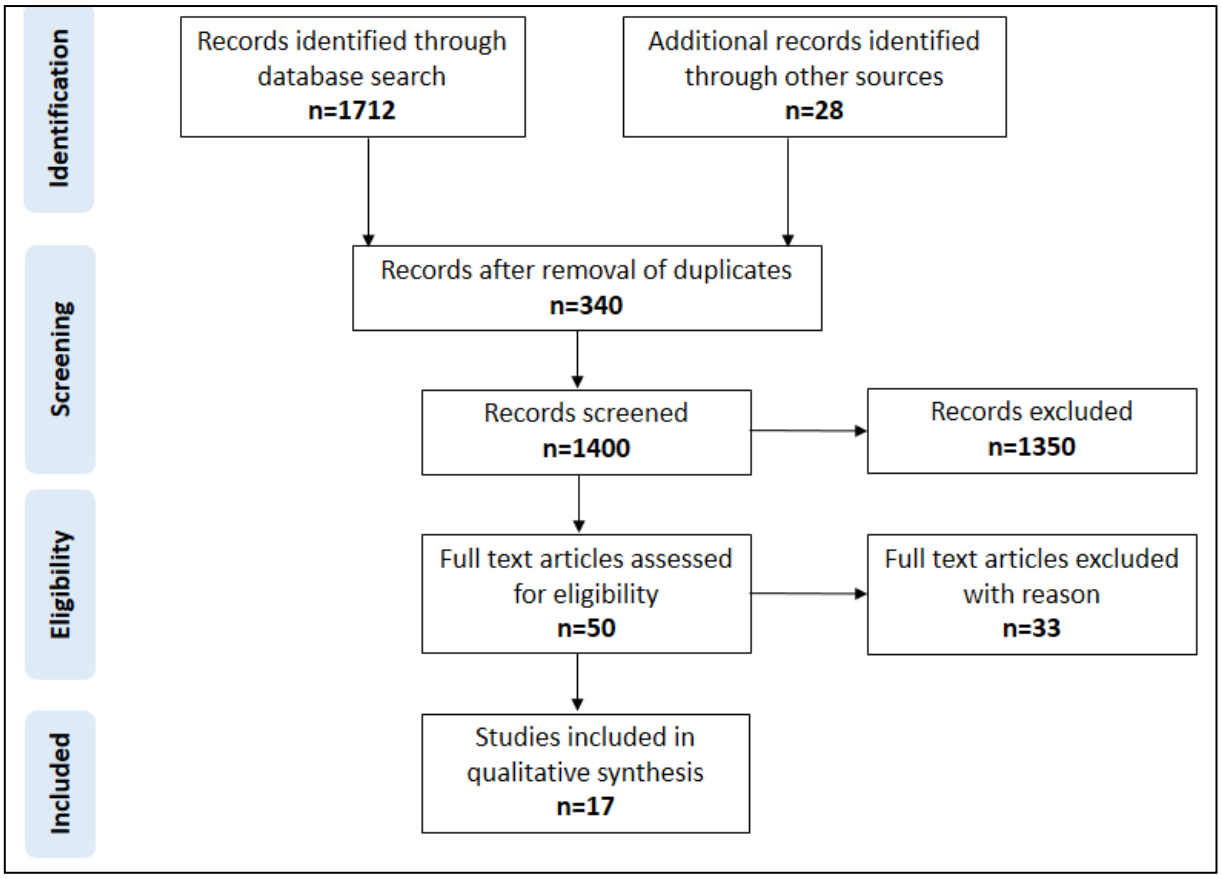


**Figure 1: PRISMA flow diagram**

## RESULTS

The systematic review included 17 studies from various regions of India, encompassing a range of study designs, age groups, and settings. The findings were organized into four thematic categories: nationwide/large multi-center studies, hospital-based/tertiary care studies, adolescent/college-based studies, and rural/community-based adult women.

Two nationwide surveys were included (Table 1). The first, conducted by Ganie et al. (2024), recruited 9,824 women aged 18–40 years across India and applied NIH, Rotterdam, and AE-PCOS diagnostic criteria. The prevalence of PCOS varied with the criteria used: 7.2% by NIH, 19.6% by Rotterdam, and 13.6% by AE-PCOS, with phenotype C being the most common. Metabolic comorbidities, including obesity, dyslipidemia, and insulin resistance, were highly prevalent among affected women. The second nationwide survey (Ganie et al., 2023) analyzed anthropometric and sociodemographic characteristics of 7,107 healthy women and reported obesity prevalence ranging from 8.1% (WHO criteria) to 40% (revised Indian guidelines), with urban residence significantly associated with higher rates of overweight and obesity. These large-scale studies highlight the burden of PCOS and associated metabolic risk factors at the national level.

Hospital-based studies (Table 2) predominantly recruited women from tertiary care centers, enabling detailed clinical, biochemical, and sonographic assessment. Prevalence estimates varied widely: Jain et al. (2024) reported a prevalence of 72.47% among 150 women in Dharwad, Karnataka, while Mehreen et al. (2021) found an 8.1% prevalence among 518 adolescents and young women. In Kashmir Valley, Ganie et al. (2020) reported 35.3% prevalence using Rotterdam criteria. A systematic review and meta-analysis of 11 Indian studies (Bharali et al., 2022) calculated a pooled prevalence of 11.33%, with higher estimates observed using Rotterdam and AES criteria (~10%) compared with NIH criteria (5.8%). These hospital-based studies demonstrate that tertiary care settings often report higher prevalence, reflecting referral bias and concentrated clinical evaluation, but also allow identification of risk factors such as BMI, waist-hip ratio, diet, and hormonal profiles (LH/FSH, AMH).

Adolescent and college-based studies (Table 3) highlight the emergence of PCOS in younger populations. Prevalence ranged from 8.2% (Gupta et al., 2018, Bhopal) to 22.5% (Joshi et al., 2014, Mumbai) using various diagnostic criteria, predominantly Rotterdam. Risk factors such as obesity, central adiposity, sedentary lifestyle, irregular menses, and hyperandrogenism were consistently reported. Notably, more than half of the affected college students were undiagnosed prior to the studies (Vijaya et al., 2014, Pondicherry). Several studies also identified unique risk associations, including cesarean mode of delivery and eruption of wisdom teeth in adolescents (Bhuvanashree et al., 2013, Nellore). Overall, these studies underscore the importance of early detection and lifestyle interventions in adolescence to prevent long-term reproductive and metabolic complications.

Rural and community-based studies (Table 4) provide insight into PCOS prevalence outside hospital settings. Sharma et al. (2025) reported a prevalence of 17.4% among 1,164 college females in Delhi NCR, with higher rates in women aged ≥20 years, those with higher education, East Indian ancestry, and nuclear family backgrounds. In rural Telangana, Purushotham Kusuma et al. (2021) found an 11.5% prevalence among 624 reproductive-age women, with infertility being a common manifestation and only 18% previously treated. These findings emphasize that PCOS remains underdiagnosed in community settings, particularly in rural areas, highlighting the need for public health interventions and awareness programs.

**Table 1: Nationwide / Large Multi-Center Studies**

| Citation | Study Population & Design | Diagnostic Criteria / Assessment | Prevalence / Key Findings |
|---|---|---|---|
| Ganie MA et al., 2024 [16] | 9,824 women, 18–40 yrs, nationwide, cross-sectional | NIH, Rotterdam, AE-PCOS; clinical, hormonal, USG | 7.2% (NIH), 19.6% (Rotterdam), 13.6% (AE-PCOS); phenotype C most common; metabolic comorbidities prevalent |
| Ganie MA et al., 2023 [17] | 7,107 healthy women, 18–40 yrs, nationwide survey | Anthropometric & sociodemographic assessment | Obesity prevalence 8.1% (WHO) to 40% (Indian guidelines); urban residence associated with higher overweight/obesity |

**Table 2: Hospital-Based / Tertiary Care Studies**

| Citation | Study Population & Design | Diagnostic Criteria / Assessment | Prevalence / Key Findings |
|---|---|---|---|
| Jain A et al., 2024 [18] | 150 women, tertiary hospital, Dharwad, Karnataka; prospective observational | Rotterdam; clinical, biochemical, USG | 72.47%; highest in 27–30 yrs; associated with diet, BMI, waist-hip ratio; LH/FSH & AMH significant |
| Mehreen TS et al., 2021 [19] | 518 adolescents & young women, 12–30 yrs; cross-sectional | NIH, Rotterdam, AE-PCOS; questionnaire, USG, biochemical | 8.1% (Rotterdam); associated with obesity, insulin resistance, hypertension; prevalence increased with age |
| Ganie MA et al., 2020 [20] | 964 women, 15–40 yrs, Kashmir Valley; cross-sectional | Rotterdam, NIH, AE-PCOS; clinical, hormonal, USG | 35.3% (Rotterdam), 28.9% (NIH), 34.3% (AE-PCOS); high prevalence among Kashmiri women |
| Bharali MD et al., 2022 [21] | Systematic review & meta-analysis of 11 Indian studies (2010–2021) | NIH, Rotterdam, AES | Pooled prevalence 11.33%; Rotterdam/AES ~10%, NIH 5.8%; highlighted need for uniform diagnostic criteria |

**Table 3: Adolescent / College-Based Studies**

| Citation | Study Population & Design | Diagnostic Criteria / Assessment | Prevalence / Key Findings |
|---|---|---|---|
| Laddad MM et al., 2019 [22] | 117 adolescent girls, 15–19 yrs; prospective | Rotterdam; biochemical, hormonal, USG | 11.96%; lifestyle modification emphasized |
| Deswal R et al., 2019 [23] | Rural & urban populations; cross-sectional | Rotterdam | Urban residence associated with higher PCOS prevalence |
| Singh A et al., 2018 [24] | Adolescent girls; prospective | Rotterdam | Prevalence reported; exact value not specified |
| Nanjaiah R et al., 2018 [25] | 405 female degree students; cross-sectional | Interview-based clinical assessment | PCOS linked with oligo-menorrhea & lack of exercise |
| Gupta M et al., 2018 [26] | Young women, Bhopal; cross-sectional | Clinical assessment, BMI, waist-hip ratio | 8.2%; BMI ≥25 & waist-hip ≥0.85 strongly associated; 78.4% unaware |
| Joshi B et al., 2014 [27] | 600 adolescent & young girls, Mumbai; community-based | Rotterdam & AES; clinical, USG, biochemical | 22.5% (Rotterdam), 10.7% (AES); mild PCOS most common; non-obese majority |
| Vijaya K et al., 2014 [28] | Female medical undergraduates, Pondicherry; prospective | Rotterdam; questionnaire, physical exam, USG | 11.76%; 52.14% newly diagnosed; oligomenorrhea & hirsutism common |
| Bhuvanashree N et al., 2013 [29] | 253 adolescent females, Nellore district; cross-sectional | Clinical assessment & risk factor analysis | 15.4%; higher risk associated with cesarean delivery, wisdom tooth eruption, central obesity |
| Nidhi R et al., 2011 [30] | 460 adolescent girls, Andhra Pradesh; prospective | Rotterdam; clinical, biochemical, hormonal, USG | 9.13% (10.97% with imputed data); most had oligomenorrhea with polycystic ovaries |

**Table 4: Rural / Community-Based Adult Women**

| Citation | Study Population & Design | Diagnostic Criteria / Assessment | Prevalence / Key Findings |
|---|---|---|---|
| Sharma A et al., 2025 [31] | 1,164 college females, 18–25 yrs, Delhi NCR; cross-sectional + systematic review | Rotterdam; ultrasonography & symptom-based assessment | 17.4%; higher prevalence in age ≥20, higher education, East Indian ancestry, nuclear families |
| Purushotham Kusuma D et al., 2021 [32] | 624 reproductive-age women, 15–45 yrs, rural Telangana; cross-sectional | Clinical, biochemical & USG in suspected cases | 11.5%; infertility common; only 18% previously treated |

## DISCUSSION

This systematic review synthesizes findings from 17 studies conducted across India, providing a comprehensive and updated overview of the prevalence, phenotypic distribution, and associated comorbidities of PCOS among Indian women. By consolidating evidence from multiple regions, the review highlights the substantial burden of PCOS on women's health in India and underscores the urgent need for targeted interventions, standardized diagnostic protocols, and public health strategies aimed at early detection and management of this complex endocrine disorder.

**Prevalence and Regional Variations:** The prevalence of PCOS in India demonstrates notable regional variation, which can be attributed to differences in demographic characteristics, diagnostic criteria, and study methodologies. For example, population-based and hospital-based studies from Delhi NCR and Maharashtra reported prevalence rates of 17.4% and 22.5%, respectively [16,31], reflecting a relatively high burden in urban and semi-urban settings. In contrast, studies from Lucknow and Andhra Pradesh reported considerably lower prevalence rates of 3.7% and 9.3%, respectively [16]. These discrepancies may be influenced by several factors, including differences in the age distribution of study populations, urban versus rural settings, genetic and environmental factors, lifestyle variations, and the diagnostic criteria employed (e.g., National Institutes of Health [NIH] versus Rotterdam criteria). Additionally, some studies incorporated biochemical assessments, such as serum androgen levels, and ultrasonographic evaluation of ovarian morphology, which may have contributed to variations in prevalence estimates. Overall, these findings indicate that PCOS is a heterogeneously distributed disorder in India, necessitating region-specific strategies for screening and management.

**Phenotypic Distribution:** Analysis of phenotypic patterns in Indian women with PCOS indicates a predominance of phenotype C, characterized by ovulatory dysfunction, hyperandrogenism, and polycystic ovarian morphology, as reported in studies by Ganie et al. (2024) and Sharma et al. (2025) [16,31]. Women presenting with this phenotype commonly exhibit irregular menstrual cycles, clinical and/or biochemical signs of hyperandrogenism, and the presence of multiple ovarian follicles on ultrasonography. This distribution aligns with data from other Asian populations, suggesting potential ethnic or environmental influences on PCOS phenotypes [33]. Understanding the phenotypic distribution is critical, as it has implications for individualized management, fertility planning, and risk stratification for metabolic and cardiovascular complications.

**Metabolic Comorbidities:** The metabolic burden associated with PCOS in Indian women is substantial. Ganie et al. (2024) reported that 43.2% of women with PCOS were classified as obese, 91.9% exhibited dyslipidemia, and 32.9% had evidence of nonalcoholic fatty liver disease (NAFLD) [16]. These findings are consistent with global evidence, which indicates a strong association between PCOS and metabolic syndrome, insulin resistance, and increased cardiovascular risk []. The high prevalence of these comorbidities highlights the necessity for routine metabolic screening, lifestyle interventions, and pharmacological management in women with PCOS, particularly in those presenting with obesity or hyperandrogenism. Early identification and management of metabolic abnormalities can prevent long-term complications, including type 2 diabetes mellitus, atherosclerosis, and hepatic dysfunction.

**Adolescent and Rural Populations:** Certain population groups, such as adolescents and women residing in rural areas, appear particularly vulnerable to the impacts of PCOS. Sharma et al. (2025) reported a prevalence of 17.4% among college-going women aged 18–25 years in Delhi NCR [31], indicating that PCOS is increasingly recognized among younger women, often during critical reproductive years. In rural regions, Purushotham Kusuma et al. (2021) documented an 11.5% prevalence among reproductive-age women in Telangana [35]. These findings highlight the importance of implementing targeted awareness campaigns, educational interventions, and accessible diagnostic services for adolescents and women in rural communities to facilitate early detection and mitigate the long-term health consequences of PCOS.

**Knowledge and Awareness:** Awareness regarding PCOS remains limited among Indian women, particularly adolescents and young adults. Nallavothu et al. (2024) demonstrated that many adolescent girls possess inadequate knowledge about the disorder, leading to delayed recognition, diagnosis, and treatment [36]. This knowledge gap emphasizes the need for structured educational programs, school- and college-based health initiatives, and community outreach campaigns to increase awareness, dispel misconceptions, and promote timely consultation with healthcare providers. Improved awareness may also encourage lifestyle modifications that reduce the severity of symptoms and associated metabolic risks.

**Limitations and Future Directions:** Despite the valuable insights provided by this review, several limitations should be considered. The included studies utilized diverse diagnostic criteria, ranging from NIH to Rotterdam guidelines, which may affect the comparability of prevalence estimates. Additionally, the majority of studies employed cross-sectional designs, which preclude causal inferences regarding the development and progression of PCOS and its comorbidities. There is also a paucity of data from certain regions and rural populations, limiting the generalizability of findings. Future research should prioritize longitudinal cohort studies employing standardized diagnostic criteria and comprehensive phenotyping to better understand the natural history, pathophysiology, and long-term outcomes of PCOS in the Indian context. Further investigation into genetic, lifestyle, and environmental determinants is warranted to inform tailored interventions and public health strategies aimed at mitigating the growing burden of PCOS in India.

## CONCLUSION

PCOS is a common endocrine disorder among Indian women of reproductive age, with prevalence varying by region, age, and diagnostic criteria. Across the included studies, the prevalence of PCOS in India varied widely depending on the study population, setting, and diagnostic criteria used, ranging from 4.2% to 72.5%. Nationwide and hospital-based studies highlight a substantial burden, often underdiagnosed, especially in adolescents and rural populations. Key risk factors include obesity, central adiposity, menstrual irregularities, hyperandrogenism, and sedentary lifestyle. Early detection, lifestyle modification, and awareness programs are crucial to prevent long-term reproductive and metabolic complications.

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