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Polycystic Ovary Syndrome (PCOS) in Young Indian Women: A Regional Review of Prevalence, Risk Factors, and Public Health Implications

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ABSTRACT :

Globally, PCOS is the most common endocrinological condition affecting women of reproductive age. In order to inform health policies and treatments, region-specific assessments are necessary given its rising incidence in India, particularly among young women. This review summarizes the results of recent research on vitamin B12 deficiency in PCOS patients on metformin therapy, as well as findings from relevant studies carried out in Delhi NCR, Kerala, and Karnataka. The prevalence rates vary from 17.4% to more than 70%, contingent on the population's characteristics, diagnostic criteria, and diagnostic situation. Socioeconomic level, family structure, food habits, hirsutism, and body mass index are important risk factors. Although technique and demographics differed, all research employed the Rotterdam criteria for diagnosis. The research emphasizes that in order to stop the rising prevalence of PCOS among Indian young, targeted awareness campaigns, early detection procedures in educational institutions, and lifestyle modification techniques are required. Screening for PCOS should be incorporated into larger reproductive health initiatives by public health policies.

Keywords: PCOS, India, Rotterdam Criteria, College Students, Vitamin B12, Lifestyle Disorders, Public Health, Urban Health, Reproductive Endocrinology

Introduction

PCOS is a chronic hormonal disorder that affects over 10% of women globally who are of reproductive age. It is one of the most prevalent causes of infertility and is becoming more well acknowledged for its wider effects on the body and mind. Although the disease can manifest in a variety of ways, hyperandrogenism, irregular menstrual periods, and ultrasound-visible polycystic ovaries are common symptoms. However, because symptoms can vary, features can overlap with other disorders, and diagnostic criteria are always changing, the diagnosis is still difficult.

In India, the number of young women with PCOS has increased significantly, especially in urban and semi-urban areas. Research indicates that changes in lifestyle, such as consuming more processed meals, being less active, and experiencing psychological stress, are important factors. Yet, endocrine disruptors, genetic predisposition, and micronutrient deficiencies all play important roles in PCOS, which is not just a lifestyle condition.

In this study, data from four recent studies in Kerala, Delhi NCR, North Karnataka, and a review on vitamin B12 insufficiency in PCOS patients are synthesized to provide a region-specific understanding of PCOS prevalence, diagnostic problems, risk factors, and policy implications. We want to find trends in our study that will help guide focused initiatives and promote improved PCOS care among young Indians.

Review of Methodology

In this narrative review, four peer-reviewed research that were published between 2023 and 2025 are summarized:

1. Thrissur, Kerala: A cross-sectional prevalence survey of 1250 college students.
2. A study that examined 1164 female college students in Delhi NCR.
3. A 150-woman clinical observational study conducted at a North Karnataka tertiary hospital.
4. An account of how metformin treatment affects vitamin B12 deficiency in people with diabetes and PCOS.

Inclusion criteria for the reviewed studies include: Rotterdam criteria-based diagnosis, an emphasis on PCOS-related symptoms, sociodemographic characteristics, and biochemical markers, and a participant age mostly between 18 and 30 years. From the standpoints of epidemiology, clinical practice, and metabolism, every study advances our knowledge of PCOS.

***Comparative Summary of Included Studies*:**
Comparative Overview of the Included Research Geographical locations, demographic kinds, and methodological frameworks are all represented in the

four research that make up this study. When taken as a whole, they offer a thorough overview of the prevalence of PCOS and related characteristics among Indian young women. Below is a comparison of their design, results, and implications.

Study Location	Sample Size	Population Focus	Diagnostic Basis	Key Findings
Thrissur, Kerala	1250	College students (18–21)	Rotterdam + Hirsutism	25.2% at risk; strong links to BMI, hirsutism, lifestyle
Delhi NCR	1164	College females (18–25)	Self-report + Rotterdam	17.4% diagnosed; nuclear families, education linked to risk
North Karnataka	150	Hospital patients (18–30)	Clinical Rotterdam	72.5% PCOS prevalence; high AMH, LH/FSH ratios, BMI impact
Narrative Review	-	Metformin users with PCOS/T2DM	Literature synthesis	Vitamin B12 deficiency prevalent; worsens with metformin use

In addition to Rotterdam criteria, the Thrissur study used a large-scale, college-based screening strategy that combined hirsutism rating and symptom checklists. As a result, even without confirming imaging, at-risk patients could be identified. Changeable lifestyle factors were highlighted in the study, and school-based interventions were suggested.

The prevalence of PCOS was 17.4% in Delhi NCR, according to a study on urban college students. Sedentary behaviour, academic stress, and nuclear family arrangements were all linked to this condition. The study's self-reported results, which may have underreported the true prevalence but nevertheless provide insightful behavioural information, were validated by a restricted clinical assessment.

On the other hand, thorough biochemical and imaging studies were carried out in the North Karnataka hospital-based investigation. Perhaps as a result of its clinical sampling, it found a significantly greater prevalence of PCOS (72.5%). The study offers solid hormonal evidence, especially high levels of AMH and LH/FSH ratios, which are indicators of endocrine disturbance in PCOS patients.

Finally, the narrative review highlighted the possibility of vitamin B12 deficiency linked to long-term metformin use, which added a metabolic element to the analysis. It links clinical pharmacology and nutritional status, bringing attention to a frequently disregarded side effect of PCOS treatment, even if it is not an empirical study.

These studies collectively highlight the significance of multidimensional screening and intervention strategies throughout India by capturing the various facets of PCOS, from metabolically challenged hospital patients to asymptomatic student populations.

Patterns of Prevalence and Regional Variability

Overall, the reviewed studies show that the prevalence of PCOS in young Indian women varies significantly depending on research design, population type, and geographic region. PCOS prevalence varied from 17.4% to 25.2% in community-based settings such as Thrissur and Delhi NCR, which is consistent with national statistics. Nonetheless, the frequency increased to 72.5% in a North Karnataka tertiary hospital setting, most likely as a result of a concentration of high-risk or symptomatic patients in need of specialist care.

The comparatively high frequency in urban areas like Delhi NCR was probably caused by risk factors associated with lifestyle choices like stress, sedentary activity, and high-calorie diets. In contrast, Keralans who lived in semi-urban areas also exhibited high levels of risk, suggesting that PCOS is a common condition regardless of total urbanization.

The methods used to measure PCOS vary between the research as well: thorough biochemical and ultrasonographic evaluation versus self-reported diagnosis and symptom-based screening. Prevalence rate comparability and dependability are impacted by this. Although the Rotterdam criteria are used consistently in all studies, big surveys that rely solely on clinical symptoms run the risk of being overestimated or underestimated.

Overall, the studies concur that PCOS is a serious and growing issue among Indian youth, despite varying incidence rates, and that more awareness, screening, and support networks are needed in both urban and semi-urban settings.

Risk Factors and Associated Variables

Numerous risk variables were linked to PCOS in the analyzed studies. A high body mass index (BMI), central obesity, and biochemical indicators such higher anti-Müllerian hormone (AMH) levels and an elevated LH/FSH ratio were common clinical variables. During clinical evaluations, hirsutism and oligomenorrhea were the most often noted symptoms.

Sociodemographic characteristics were also important. Women from nuclear households, those who lead sedentary lives, and those with greater educational attainment all had higher PCOS prevalence, according to the Delhi NCR study. The symptoms of PCOS were also significantly influenced by lifestyle factors in Kerala, including stress, poor food, and lack of physical activity.

The study conducted in a hospital in North Karnataka focused on biochemical anomalies, finding a high link between elevated AMH, a disturbed LH/FSH ratio, and an elevated BMI. When PCOS sufferers were compared to the control group, these metrics showed a significant difference. In PCOS patients on metformin therapy, vitamin B12 insufficiency was identified as another significant metabolic factor by the narrative review. In PCOS, long-term use of metformin, which is frequently used to treat insulin resistance, has been associated with lower B12 levels, which may exacerbate neuropathy and exhaustion.

The reviewed research, in summary, highlight the multifactorial character of PCOS, which is influenced by a complex interaction of metabolic, hormonal, genetic, and lifestyle factors. A comprehensive diagnostic strategy that takes into account both clinical and psychosocial factors is crucial, as these data highlight.

Methods and Criteria for Diagnostics

The Rotterdam criteria, which are now the most widely used clinical guideline, were used in all of the included studies to diagnose PCOS. This criteria states that at least two of the three characteristics listed below must be present for a PCOS diagnosis:

1. Oligo- or anovulation
2. Biochemical and/or clinical indications of hyperandrogenism
3. On ultrasonography, polycystic ovaries

As long as other symptoms are present, this inclusive framework makes it possible to diagnose PCOS even in the absence of cystic ovaries. Diagnostic consistency may be impacted, nevertheless, by variations in the criteria's application, particularly in community contexts as opposed to hospital settings.

The depth of diagnosis was limited in the community-based studies (Delhi NCR and Kerala) since the main instruments were frequently self-reported symptoms and simple anthropometric evaluations. On the other hand, the North Karnataka study had a greater detection rate since it carried out a more thorough hormonal profile and ultrasonographic examination.

Finding a balance between accurate diagnosis and affordable screening techniques is difficult, particularly in environments with large populations or limited resources. Particularly in educational institutions where early detection can greatly enhance long-term reproductive and metabolic health outcomes, standardized screening procedures catered to young, asymptomatic individuals are required.

Policy Recommendations and Implications for Public Health

The prevalence of PCOS in young Indian women is a serious public health concern that affects metabolic, psychosocial, and reproductive health consequences. To lower long-term consequences like depression, type 2 diabetes, cardiovascular disease, and infertility, early detection and intervention are essential.

Since many cases of PCOS go undetected during youth and the early stages of adulthood, educational institutions present a specific opportunity to establish screening and awareness campaigns. Lifestyle counselling, menstrual health education, and campus-based health camps could all be low-cost, high-impact interventions.

National programs for adolescent and reproductive health should specifically address PCOS from a policy perspective. Early detection can be made possible by standardizing screening procedures in primary care and school health systems. Including nutrition and exercise initiatives like Poshan Abhiyaan or India's Fit India Movement could increase awareness even more.

Medical professionals should also receive training on evidence-based, non-stigmatizing methods of managing PCOS. This entails being aware of the psychological toll that problems like obesity, infertility, and acne take on many patients, as well as making sure that mental health assistance is incorporated into the treatment plan.

The role of micronutrient shortages, long-term effects of lifestyle modifications, and regional variances all require further research funding. To create registries, carry out longitudinal studies, and produce culturally appropriate teaching materials, government and academic institutions must work together.

Research Gaps and Future Directions

Even though PCOS is receiving more attention in India, there are still significant gaps in diagnosis, research, and policy implementation. Establishing nationwide prevalence estimates based on extensive, multicentric research employing standardized diagnostic frameworks is one of the most urgent demands.

Longitudinal studies that track the development of PCOS symptoms from adolescence into adulthood are similarly lacking, particularly when it comes to psychological consequences, metabolic syndrome, and fertility. The time and type of interventions would be guided in part by such data.

Furthermore, more research is required to examine the molecular causes of PCOS in the Indian setting, particularly the ways in which environmental stresses, micronutrient status (such as B12 insufficiency), local food patterns, and genetic predispositions interact particularly with regard to psychological effects, metabolic syndrome, and fertility as one ages. Such information might be useful in determining the type and timing of interventions.

Underutilized digital health solutions, including teleconsultation platforms or smartphone apps for recording symptoms, have the potential to greatly enhance early detection and lifestyle monitoring among tech-savvy young people. Research into scalable, reasonably priced screening techniques for low-resource environments would also be very beneficial.

Finally, in order to de-stigmatize the disease and encourage help-seeking behaviour, particularly in conservative societies where conversations about reproductive health are frequently silenced, gender-sensitive, culturally contextualized awareness efforts are required.

PCOS's Social and Psychological Effects

PCOS has serious psychological and social effects in addition to its metabolic and reproductive ones, which are frequently overlooked in therapeutic settings. A lower quality of life and increased levels of stress, anxiety, and depression are common among women with PCOS. Low self-esteem and social disengagement can result from symptoms including hirsutism, acne, obesity, and infertility, which frequently make these mental health conditions worse.

Many young women in India experience stigma or misinterpretation from their families and communities due to the delicate nature of conversations about reproductive and hormonal health. Women with PCOS may be particularly burdened by the cultural pressure to get married young and have children, which exacerbates emotional anguish.

The management of PCOS requires a more comprehensive strategy from healthcare providers and educational institutions, one that incorporates peer support groups, psychiatric counselling, and awareness campaigns that normalize candid conversations about the disorder. Gynaecological care systems and adolescent health clinics should incorporate mental health treatments.

In different Indian communities, further research is required to measure the psychosocial burden of PCOS and assess therapies that can reduce stigma while boosting resilience. For women with PCOS, empowering them with information, self-care tools, and inclusive health services can significantly improve their outcomes.

Conclusion

In India, PCOS is a complex illness that is becoming more common among young women across both regional and urban-rural divides. The results from North Karnataka, Delhi NCR, and Kerala show both contextual variations and similarities in the condition's expression. Obesity, hormone imbalances, and lifestyle choices are risk factors that play a major role in the beginning of disease, and sociocultural variables have an impact on diagnosis and treatment.

A strong foundation for uniformity in clinical and public health contexts is provided by standardized diagnostic procedures, particularly those based on the Rotterdam criteria. Variations in implementation, however, highlight the need for more accessible hormonal and ultrasonographic examinations in community settings as well as scalable screening methods.

It is now necessary for public health systems to change from awareness to action. It is essential to include PCOS into national reproductive health agendas, implement school and college health programs, and engage in culturally appropriate outreach. Investing in digital advances and longitudinal research to support patient-centered treatment and early diagnosis is equally crucial

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