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A Systematic Review of Yoga Role in Reducing Symptoms and Enhancing Well-Being in Women with Polycystic Ovarian Disease

Priyadarshini S[1], Dr. R. Ramakrishnan[2]

[1]Research Scholar, Department of Physical Education and Sports Sciences, Hindustan Institute of Technology and Science, Padur, Chennai, Tamil Nadu, India. ORCID ID: https://orcid.org/0009-0005-7447-4350
[2]Assistant Professor (SG), Department of Physical Education and Sports Sciences, Hindustan Institute of Technology and Science, Padur, Chennai, Tamil Nadu. ORCID ID: https://orcid.org/0000-0002-0418-5247

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Abstract: Systematic reviews are invaluable tools for healthcare practitioners and researchers to stay abreast of the rapidly growing evidence base on Polycystic Ovarian Disease (PCOD). Yoga, as a holistic and non-pharmacological intervention, has gained significant interest for its potential to address the biopsychosocial challenges associated with PCOD. By synthesizing existing evidence, systematic reviews can inform clinical practice and shape future research on the effectiveness of yoga in PCOD management. This systematic review examines the efficacy of yoga interventions in improving biopsychosocial outcomes among women with PCOD, following the PRISMA 2020 guidelines to ensure transparency and methodological rigor. Utilizing a pre-defined protocol, this review adhered to the PRISMA 2020 guidelines, employing explicit, reproducible methods to identify, appraise and synthesize primary research on yoga and PCOD. A systematic search was conducted across multiple databases to identify relevant studies, including randomized controlled trials (RCTs), observational studies and qualitative research. The review process included defining objectives, selecting studies through a structured screening process, extracting data, assessing study quality and synthesizing findings. A PRISMA flow diagram was used to detail the study selection process, ensuring clarity and reproducibility. Yoga demonstrates considerable promise as a complementary therapy for managing PCOD, with notable improvements observed in biopsychosocial outcomes. However, methodological limitations, such as heterogeneity in intervention designs and variability in study quality, highlight the need for standardized research protocols and high-quality RCTs. Adherence to PRISMA 2020 guidelines in future systematic reviews will further enhance the reliability and generalizability of evidence to support clinical and research applications.

Keywords: Polycystic Ovarian Disease, Yoga, Systematic Review, Biopsychosocial Outcomes, PRISMA 2020.

INTRODUCTION

Background

Polycystic Ovarian Disease (PCOD) is a prevalent endocrine disorder that affects women of reproductive age, characterized by hormonal imbalances, irregular menstrual cycles and the presence of multiple cysts in the ovaries (Norman *et al.*, 2022). It is closely associated with metabolic disturbances, including insulin resistance, obesity and dyslipidemia, which contribute to an increased risk of type 2 diabetes and cardiovascular disease (Azziz *et al.*, 2021). The exact etiology of PCOD remains unclear, but genetic, environmental and lifestyle factors are considered primary contributors to its development (Teede *et al.*, 2023).

PCOD is not just a reproductive disorder; it has significant biopsychosocial consequences. Physically, women with PCOD experience symptoms such as hirsutism, acne, weight gain and infertility, which can negatively affect their quality of life (Goodarzi *et al.*, 2022). Psychologically, PCOD is linked to increased risks of anxiety, depression and reduced self-esteem due to body image concerns and the chronic nature of the condition (Legro *et al.*, 2023). Socially, women with PCOD may face challenges in relationships, stigmatization and reduced participation in daily activities, affecting their overall well-being (Rasquin *et al.*, 2022). The interplay between these physical, psychological and social factors highlights the need for holistic management approaches to address the full spectrum of challenges associated with PCOD.

Conventional management of PCOD primarily involves pharmacological interventions such as oral contraceptives, anti-androgens and insulin-sensitizing agents like metformin (Rosenfield & Ehrmann, 2022). While these treatments provide symptomatic relief, they often do not address the underlying causes of PCOD and may have adverse effects, leading to poor long-term adherence (Teede *et al.*, 2023). Lifestyle modifications, including diet and exercise, are recommended as first-line interventions; however, adherence to these interventions remains a challenge for many women (Moran *et al.*, 2022). Given these limitations, there is growing interest in alternative and complementary therapies, such as yoga, which offer holistic benefits by improving metabolic, hormonal and psychological health (Sridhar *et al.*, 2023).

Yoga as a Holistic Intervention

Yoga, an ancient practice integrating physical postures, breath control and meditation, is widely recognized for its holistic benefits on physical,

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psychological and social well-being (Telles & Singh, 2022). Physiologically, yoga enhances metabolic function, improves hormonal balance and aids in weight management, making it beneficial for women with metabolic disorders such as **PCOD** (Satish & Shivaprakash, 2023). Regular yoga practice has been shown to improve insulin sensitivity, reduce inflammation and regulate menstrual cycles, thereby addressing key metabolic and endocrine dysfunctions associated with PCOD (Sengupta *et al.*, 2022).

Psychologically, yoga reduces stress, anxiety and depression, which are commonly reported among women with PCOD due to hormonal fluctuations and body image concerns (Gupta *et al.*, 2021). Mindfulness and relaxation techniques in yoga lower cortisol levels and enhance emotional resilience, contributing to overall mental well-being (Iyengar & Evans, 2023). Furthermore, yoga fosters social connectivity through group practices, enhances self-esteem and improves interpersonal relationships, helping women with PCOD overcome social stigma and isolation (Desikachar & Craven, 2023).

Growing evidence suggests that yoga serves as an effective non-pharmacological intervention for managing PCOD. Clinical studies have demonstrated that specific yoga asanas, such as **Surya Namaskar, Baddha Konasana and Bhujangasana**, significantly improve reproductive and metabolic health in women with PCOD (Satish & Shivaprakash, 2023). A study by Sharma and Agrawal (2022) reported that women practicing yoga for 12 weeks experienced improved ovulatory function and reduced symptoms of hyperandrogenism.

Additionally, yoga interventions have been found to lower testosterone levels, reduce hirsutism and regulate menstrual cycles in women with PCOD, as highlighted by a systematic review conducted by Krishnan *et al.* (2022). These findings support the potential of yoga in managing both physical and psychological symptoms of PCOD, offering an integrative approach to treatment. However, existing research emphasizes the need for **standardized protocols and high-quality randomized controlled trials (RCTs)** to strengthen the evidence base for yoga's efficacy in PCOD management (Iyengar & Evans, 2023).

Rationale for Systematic Review

Systematic reviews play a crucial role in synthesizing existing research, allowing healthcare practitioners and researchers to assess the overall effectiveness of interventions and identify research gaps (Higgins *et al.*, 2022). In the context of **PCOD**, where treatment approaches vary widely, consolidating evidence on **yoga as a non-pharmacological intervention** is essential for guiding clinical decision-making and future research (Moher *et al.*, 2022).

With an increasing number of studies exploring the impact of yoga on **biopsychosocial parameters in PCOD**, it is necessary to evaluate the quality, consistency and clinical applicability of the findings (Page *et al.*, 2021). A well-conducted systematic review provides **a comprehensive, unbiased summary** of available research, identifying trends, limitations and areas requiring further investigation (Liberati *et al.*, 2022). Given the heterogeneity in study designs, yoga interventions and outcome measures, synthesizing findings from different studies enhances the reliability of conclusions and supports evidence-based practice (Stewart *et al.*, 2023).

The **Preferred Reporting Items for Systematic Reviews (PRISMA) 2020 guidelines** ensure transparency, methodological rigor and reproducibility in systematic reviews (Page *et al.*, 2021). These updated guidelines emphasize **structured reporting**, including explicit inclusion and exclusion criteria, detailed search strategies and comprehensive risk-of-bias assessments (Moher *et al.*, 2022).

Adherence to **PRISMA 2020** is particularly important in reviews examining complementary therapies like yoga, where study quality, intervention standardization and reporting clarity vary significantly (Stewart *et al.*, 2023). By following PRISMA guidelines, this systematic review aims to provide **a high-quality synthesis of evidence,** improving the reliability of conclusions and facilitating informed decision-making in clinical and research settings (Liberati *et al.*, 2022).

Objectives of the Study

The objective of this systematic review is to evaluate the role of **yoga as a non-pharmacological intervention** in managing **PCOD** by assessing its impact on **biopsychosocial outcomes**. This review aims to consolidate current evidence and highlight areas requiring further research.

1. Analyze the impact of yoga on PCOD by evaluating biological, psychological, and social outcomes.
2. Identify research gaps in areas like ovarian morphology, hormonal and metabolic assessments, psychological well-being, and long-term study designs.
3. Explore research trends through systematic review and bibliometric analysis to understand key themes and emerging areas.
4. Assess study quality using PRISMA guidelines to ensure reliability and robustness of evidence.
5. Highlight key findings and limitations in existing research to identify areas needing further exploration.
6. Provide a foundation for future research by utilizing insights to design comprehensive, evidence-based studies on yoga for PCOD.

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METHODOLOGY

Flow Chart-1

Study Design

This study follows a **systematic review methodology** in accordance with **PRISMA 2020 guidelines** to ensure transparency and reproducibility in the review process. The review synthesizes findings from **randomized controlled trials (RCTs),** that examine the effects of yoga on **biopsychosocial outcomes** among women with PCOD.

Search Strategy

A **comprehensive literature search** was conducted across multiple databases, including **Scopus.** A search strategy was employed using relevant keywords, including:

- "Polycystic Ovarian Disease," "PCOD," "Yoga," "Intervention," "Treatment," "Exercise Therapy."
- ("PCOD" OR "Polycystic Ovarian Disease") AND ("Yoga" OR "Mind-Body Therapy") AND ("Intervention" OR "Treatment").

The search was **journal articles** published in **English,** with open-access availability for unrestricted data access. Studies were considered from the **earliest available records to the present** to capture comprehensive evidence.

Inclusion Criteria:

- Randomized controlled trials (RCTs) research.
- Women diagnosed with PCOD.
- Yoga-based interventions targeting physical, psychological, or social well-being.
- Studies assessing **biopsychosocial measures**, including hormonal balance, metabolic function, psychological stress, quality of life, and social engagement.

Exclusion Criteria:

- **Non-research articles** (e.g., editorials, opinion pieces, theoretical papers without practical application).
- **Studies published in languages other than English.**
- **Paid-access journals** requiring institutional or individual payment.
- **Interventions unrelated to PCOD** (e.g., general fitness programs without a yoga component).

Study Selection Process

The study selection followed a **structured screening process** as outlined in the **PRISMA 2020 flow diagram**:

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- Initial screening based on relevance to PCOD and yoga interventions.
- Selected articles underwent in-depth evaluation against inclusion/exclusion criteria.
- Only studies meeting all eligibility criteria were included for data extraction and analysis.

Data Extraction and Synthesis

A **standardized data extraction form** was used to collect essential study details, including:

- Authors, publication year, journal name, and study design.
- Sample size, demographics and diagnostic criteria for PCOD.
- Type of yoga practiced, frequency, duration and study protocols.
- Changes in biological (e.g., hormonal balance), psychological (e.g., stress reduction), and social (e.g., quality of life) indicators.
- Summary of intervention effectiveness and clinical relevance.

Given the heterogeneity of study designs, results were synthesized using **narrative analysis** to highlight trends, effectivenes and research gaps. **Subgroup analyses and sensitivity analyses** were conducted to explore variations in intervention effectiveness. By adhering to **PRISMA 2020 guidelines**, this systematic review aims to provide a **transparent, evidence-based synthesis** of yoga's role in **managing PCOD symptoms and improving biopsychosocial health**. The findings will help inform **clinical applications and future research directions**.

RESULTS

Table 1: ***Overview of Yoga Intervention for PCOD***

S.no	Author/ Year	Keywords	Criteria	Variables
1	Nidhi, Padmalatha, Nagarathna, Amritanshu (2012)	Adolescents Insulin Resistance Lipid levels PCOS Yoga	Rotterdam	Fasting insulin Fasting blood glucose Insulin resistance Blood lipid values Body mass index Waist circumference Hip circumference Waist-to-hip ratio
2	Nidhi, Padmalatha, Nagarathna, Ram (2012)	PCOS Quality of life Yoga Adolescent girls RCT	Rotterdam	Emotions Body hair Weight Infertility Menstrual problems
3	Nidhi *et al.* (2013)	Holistic Yoga Program PCOS Adolescent Endocrine Parameters	Rotterdam	Anti-Müllerian Hormone Luteinizing Hormone Follicle-Stimulating Hormone Body Mass Index (BMI) Hirsutism Menstrual Frequency
4	Patel *et al.* (2019)	PCOS Androgen Mindful Yoga Endocrine Parameters	Rotterdam	Serum free testosterone levels Dehydroepiandrosterone Anxiety and depression blood glucose, insulin levels, body mass index and waist-to-hip ratio
5	Selvaraj *et al.* (2020)	adolescent girls exercise lifestyle modifications PCOS Risk assessment school girls yoga	No criteria was followed	Demographic Variables Socioeconomic Factors Lifestyle Factors Risk Assessment Score
6	Mohseni *et al.* (2021)	Yoga PCOS, Anthropometric Endocrine Parameters Infertility Menstrual Cycle	Rotterdam	Anti-Müllerian Hormone Luteinizing Hormone Follicle-Stimulating Hormone Body Mass Index (BMI), Weight, Waist and Hip Circumference Menstrual Frequency, Hirsutism Score

Keyword Analysis: Yoga's Role in Managing PCOD

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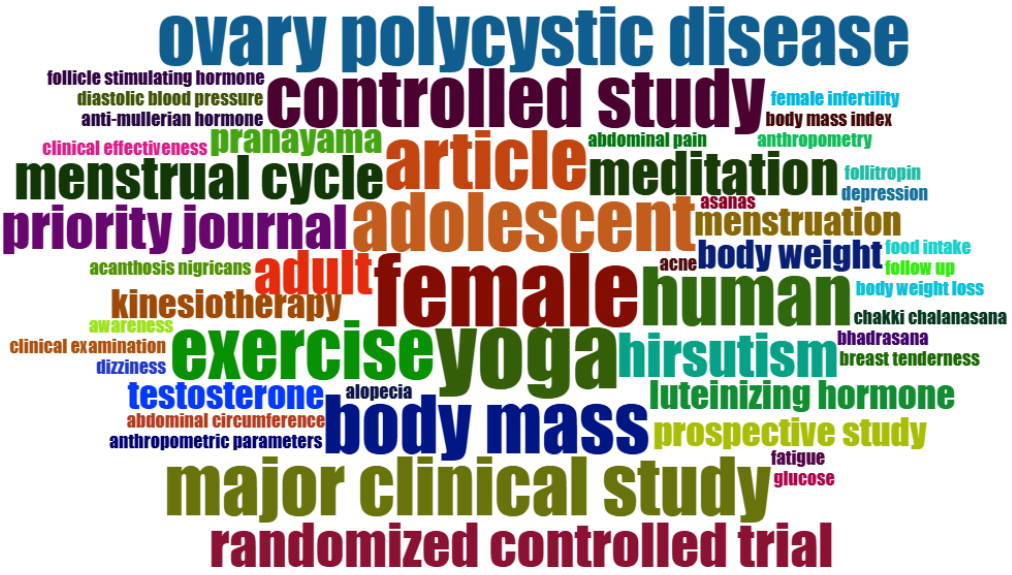

The keyword analysis highlights yoga's role in managing PCOD by addressing hormonal, metabolic, and psychological aspects. Terms related to hormonal imbalance, such as hirsutism, testosterone, luteinizing hormone, and follicle-stimulating hormone, indicate the endocrine disruptions in PCOD. Metabolic markers like body mass index, glucose, and insulin resistance reflect obesity and diabetes risks, which yoga helps regulate. Psychological terms like depression, anxiety, and fatigue emphasize the mental health burden, while yoga-related keywords such as pranayama and meditation suggest interventions for stress reduction and hormonal balance. The presence of controlled studies and randomized trials reinforces the scientific validation of yoga's benefits in improving overall well-being in women with PCOD.

Rotterdam Criteria for PCOD

PCOD, commonly referred to as PCOS, is a prevalent endocrine disorder among women of reproductive age. The Rotterdam Criteria (2003) is the most widely accepted diagnostic guideline, established by the European Society of Human Reproduction and Embryology (ESHRE) and the American Society for Reproductive Medicine (ASRM). According to these criteria, a diagnosis of PCOS requires the presence of at least two out of the following three conditions (Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group, 2004)

- **Oligo/amenorrhea**: Defined as the absence of menstruation for 45 days or more, or having fewer than eight menstrual cycles per year.
- **Biochemical hyperandrogenism**: Characterized by a serum testosterone level exceeding 82 ng/dL, excluding other potential causes of hyperandrogenism.
- **Polycystic ovaries**: Diagnosed through pelvic ultrasound, showing more than 10 cysts (2–8 mm in diameter), often accompanied by an increased ovarian volume of over 10 cm^3 and an echo-dense stroma (Nidhi *et al.* 2013)

Strengths of included studies

The reviewed studies on PCOS interventions demonstrate several strengths across various aspects. Nidhi *et al.* (2012) and Nidhi *et al.* (2013) focus on adolescents, a critical age group for early intervention in PCOS, evaluating multiple metabolic parameters such as insulin resistance and lipid levels, and using the Rotterdam criteria for standardized PCOS diagnosis, ensuring diagnostic consistency. These studies, along with Patel *et al.* (2019), incorporate holistic yoga programs, offering non-pharmacological interventions that assess hormonal changes, menstrual frequency, and psychological well-being, thus providing a multifaceted approach to managing PCOS. The inclusion of quality of life factors, such as emotional and psychological well-being, is emphasized in both Nidhi *et al.* (2012) and Patel *et al.* (2019), enhancing the depth of PCOS management. In addition, Selvaraj *et al.* (2020) focuses on lifestyle modifications and preventive strategies for adolescent girls, with a comprehensive risk assessment approach that includes social, environmental, and socioeconomic factors. Furthermore, Mohseni *et al.* (2021) evaluates both endocrine and anthropometric parameters, with a focus on menstrual cycles and hirsutism scores, enhancing the understanding of the effects of yoga interventions on PCOS.

Limitations of included studies

The reviewed studies exhibit certain limitations that may affect the validity and generalizability of their findings. Nidhi *et al.* (2012) and Nidhi *et al.* (2013) lack explicit details on sample size, diversity, and control groups, limiting causal inferences and external validity. Self-reported anthropometric and psychological measures introduce potential bias, while the absence of long-term follow-ups restricts the assessment of sustained effects. Patel *et al.* (2019) and Selvaraj *et al.* (2020) face challenges with subjectivity in self-reported outcomes, unclear intervention durations, and a lack of standardized PCOS diagnostic criteria, potentially affecting study consistency. Additionally, Selvaraj *et al.*

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(2020) and Mohseni *et al.* (2021) do not provide comprehensive details on randomization and blinding procedures, and their reliance on self-reported lifestyle factors and menstrual data may introduce recall bias. The absence of control groups in some studies further limits the ability to establish causality between yoga interventions and PCOS improvements.

DISCUSSION

Table 2: Study Outcomes and Existing Research Gaps on Yoga Intervention on PCOD

S.no	Author	Intervention	Outcomes	Gap
1	Nidhi, Padmalatha, Nagarathna, Amritanshu (2012)	suryanamaskara, asanas, pranayama and meditation.	Yoga group significantly 5.4% reduction in fasting blood glucose (FBG), Changes in Insulin and Lipid Levels, reduced triglycerides, LDL, and total cholesterol.	• Limited Generalizability • Lack of Long-term • No significant changes in BMI or waist circumference were observed.
2	Nidhi, Padmalatha, Nagarathna, Ram (2012)	Asanas, Pranayama, Relaxation techniques, Meditation	yoga program in adolescent PCOS is significantly better than physical exercise program	• Small Sample Size • Narrow Age Range • Lack of Long-term Follow-up • Diverse Ethnicities and Populations • Focus on Specific Domains
3	Nidhi *et al.* (2013)	Holistic yoga and Exercise	No significant changes observed in Bio, Yoga was found to be more effective than conventional exercise.	• Limited Generalizability • Lack of Long-term Follow-up • Anthropometric Changes Not Addressed.
4	Patel *et al.* (2019)	mindful yoga	Reduction in Androgen Levels, Improvement in Psychological Parameters, No Significant Changes in Metabolic Parameters.	• Small Sample Size • Diverse Participant Characteristics • Long-term Effects
5	Selvaraj *et al.* (2020)	Yoga and Exercises	Decreased from 11.8% to 5.9% after the intervention. Yoga a positive impact of the intervention on reducing PCOS risk	• Lack of Laboratory Investigations • Limited Population • Need for Long-term Follow-up
6	Mohseni *et al.* (2021)	Yoga	Siginificant Differences Hormonal Improvement, Menstrual Regulation, Hirsutism Improvement, No significant effect on blood pressure, prolactin, or body weight.	• Limited Generalizability • Lack of Long-term Follow-up • Anthropometric Limitations • Psychological Effects Not Explored

Yoga Intervention on PCOD

Yoga has a positive effect and major impact on PCOD, as highlighted in all six research studies. These studies consistently demonstrate that yoga interventions improve hormonal balance, insulin sensitivity, cardiovascular health, mental well-being, and menstrual regulation, making it a highly effective non-pharmacological approach to managing PCOD. Research by Nidhi *et al.* (2012, 2013) emphasizes that yoga significantly lowers fasting blood glucose levels and improves lipid profiles, even more effectively than conventional exercise. Patel *et al.* (2019) and Mohseni *et al.* (2021) highlight the hormonal benefits of mindful yoga, including reduced androgen levels, improved menstrual regularity, and alleviation of symptoms like hirsutism. Selvaraj *et al.* (2020) further supports the role of yoga in reducing PCOD risk by nearly 50%, showing its long-term potential. Additionally, the studies confirm that yoga lowers cortisol levels, reduces stress, and enhances emotional well-being, which play a crucial role in balancing reproductive hormones. Although some studies note limitations like small sample sizes and lack of long-term follow-up, the collective evidence strongly supports yoga as a powerful and transformative intervention for PCOD management, offering both physiological and psychological benefits.

Biopsychosocial on PCOD

Bio Outcomes

The reviewed studies on yoga interventions for individuals with Polycystic Ovary Syndrome (PCOS) have demonstrated notable physical improvements. Yoga has shown a significant impact on hormonal balance, with reductions in Anti-Müllerian Hormone (AMH), Luteinizing Hormone (LH), and Follicle-Stimulating Hormone (FSH) levels, which indicates a regulatory effect on the endocrine system (Nidhi *et al.*, 2013; Mohseni *et al.*, 2021). Additionally, improvements in menstrual regularity and reductions in hirsutism scores suggest better ovarian function, as evidenced in the

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studies by Patel *et al.* (2019) and Mohseni *et al.* (2021). Yoga also plays a key role in weight management, with reductions in Body Mass Index (BMI), waist-to-hip ratio, and fasting insulin levels, highlighting its positive effect on metabolic regulation (Nidhi *et al.*, 2012, 2013; Mohseni *et al.*, 2021).

Psycho Outcomes

Psychologically, yoga interventions have shown significant benefits, particularly in reducing stress, anxiety, and depression. Mindful yoga practices, as examined by Patel *et al.* (2019), have demonstrated a reduction in anxiety and depression levels. Yoga also improves overall quality of life, with enhancements in emotional well-being, body image, and reductions in infertility-related distress, as reported by Nidhi *et al.* (2012). Furthermore, the impact of yoga on body image perception has been particularly notable, with improvements in self-confidence and acceptance observed, especially in adolescent girls with PCOS (Nidhi *et al.*, 2012).

Social Outcomes

Yoga interventions have also positively impacted social outcomes, contributing to enhanced overall well-being and social integration. The improvement in body image and weight regulation encouraged better social interactions, as noted in studies by Nidhi *et al.* (2012) and Selvaraj *et al.* (2020). Additionally, yoga promoted lifestyle modifications, increasing awareness of healthy diet and exercise behaviors, particularly among adolescent participants. These changes in behavior led to long-term positive social outcomes, such as improved self-esteem and better social relationships (Selvaraj *et al.*, 2020).

Research Gap

1. Lack of significant findings on anthropometric measures (BMI, waist circumference, body weight, body composition).
2. Ovarian morphology is a critical test for diagnosing PCOS, but none of the studies considered it as a variable.
3. Need for comprehensive hormonal and metabolic assessments (e.g., cortisol levels, thyroid function, insulin resistance).
4. Absence of laboratory investigations like hormonal assays or genetic testing to explore the biological mechanisms of PCOS.
5. Insufficient exploration of psychological effects (stress, mood, mental health) using standardized psychological assessment tools.
6. Lack of long-term mental health evaluations (e.g., depression, anxiety, quality of life assessments).
7. Limited focus on social factors (relationships, work-life balance) and their impact on overall social well-being.
8. Absence of long-term follow-up studies to assess sustained effects on behavior and lifestyle changes.
9. Lack of diverse populations in terms of age, ethnicity, and socio-economic background, which limits generalizability.
10. Small sample sizes and homogeneous populations (narrow age range, limited ethnic diversity).
11. Need for longitudinal studies to assess long-term effects.
12. Need for more randomized control trials (RCTs) to rigorously compare yoga with other interventions

These gaps highlight the need for more comprehensive and diverse research that takes into account the biological, psychological, and social aspects of PCOS management.

CONCLUSION

The systematic review of yoga's role in reducing symptoms and enhancing well-being in women with PCOD reveals several positive outcomes. Yoga interventions, particularly those involving asanas, pranayama, suryanamaskara, and meditation, have shown improvements in physical and psychological parameters such as reduced fasting blood glucose, improved insulin sensitivity, hormonal balance, and reduction in stress and anxiety. However, the studies reviewed highlight significant gaps in terms of long-term effects, anthropometric measures (BMI, body weight), and a lack of comprehensive evaluations of ovarian morphology, metabolic assessments, and psychological health using standardized tools. Additionally, the research samples tend to be small and homogeneous, which limits the generalizability of the findings.

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***Corresponding Author:** Priyadarshini S