

9<sup>th</sup> Annual Congress on Polycystic Ovarian Syndrome and Fertility

KEYNOTE TALKS

November 27-28, 2025 | London, UK (Hybrid Event)



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### PCOS and fertility: Current challenges and innovations in research and treatment

Polycystic Ovary Syndrome (PCOS) is a multifactorial endocrine and metabolic disorder affecting approximately 5–18% of women of reproductive age and is recognized as one of the most common causes of female infertility worldwide. The disorder is characterized by insulin resistance, hyperandrogenism, chronic low-grade inflammation, and dysfunction of the hypothalamic-pituitary-ovarian (HPO) axis, resulting in anovulation, poor oocyte quality, and reduced endometrial receptivity. Despite its high prevalence, a significant proportion of women with PCOS remain undiagnosed, especially in rural and underserved regions where access to specialized diagnostic facilities is limited.

This work presents current clinical challenges in PCOS-related infertility alongside recent innovations in research and treatment. A major focus is placed on an AI- and IoT-enabled assistive system developed under the ANRF–SERB POWER Grant for real-time fertility stage identification. The system adopts a dual-mode diagnostic approach integrating automated blood-based hormonal analysis using ELISA automation and spectrophotometer-based quantification with imaging-based transvaginal ultrasound (TVUS) for comprehensive ovarian and follicular assessment. A portable 3D-printed centrifuge enables efficient serum separation, following which ELISA-based hormonal estimation (LH, FSH, AMH) is performed and quantified using a spectrophotometer (OD measurement). The acquired biochemical and ultrasound data are further processed using machine learning-based PCOS analysis for intelligent classification, fertility window prediction, and clinical decision support.

Recent advances including ultrasound-guided follicular tracking, non-invasive biomarkers, precision medicine, and phenotype-based assisted reproductive technologies are

also discussed. The proposed framework demonstrates strong potential for early diagnosis, accurate fertility window prediction, and personalized reproductive healthcare delivery. This scalable and cost-effective digital health solution offers a promising pathway to bridge fertility care gaps in resource-constrained settings and significantly strengthen PCOS management and fertility outcomes.

#### Biography

Dr. J. Yogapriya currently serves as the Dean of Research and Development and Professor in the Department of Computer Science and Engineering at Kongunadu College of Engineering and Technology (KNCET), Trichy, Tamil Nadu. In this leadership role, she is strongly committed to fostering a culture of innovation, entrepreneurship, startup development, and Intellectual Property Rights (IPR) among students and faculty members. She actively mentors student teams to participate in prestigious national-level innovation competitions such as Smart India Hackathon, Toycathon, Manthan, L&T Techgim Contest, and MSME Idea Hackathon, guiding them toward achieving awards and national recognition. Dr. Yogapriya heads the Institution Business Incubator (IBI) at KNCET and played a key role in securing recognition as a Host Institute by the Ministry of Micro, Small and Medium Enterprises (MSME). Under her guidance, the institution successfully organized four hackathons and secured ₹99.92 lakhs in MSME funding for six startup ideas, significantly strengthening the campus startup ecosystem. She has also received ₹26 lakhs in research funding from DST–SERB, supporting her work on AI- and IoT-based analysis of PCOS and fertility stages in women, with a focus on translational and societal impact.

In recognition of her contributions to innovation and women empowerment, Dr. Yogapriya was honored with the AICTE Lilavati Award in 2022 under the theme Women Entrepreneurship. She played a vital role in achieving 3.5-star and 4-star ratings for promoting innovation, entrepreneurship, and IPR culture within the institution. She also serves as the Faculty Coordinator of the AICTE IDEA Lab, facilitating advanced research equipment procurement, promoting hands-on learning, and strengthening project-based education. Notably, one of her research projects has been accepted for incubation at AMTZ (Andhra Pradesh MedTech Zone), reflecting strong industry collaboration and commercialization potential.