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Over the summer of 2025, I undertook a comprehensive, multi-phased research project investigating **Polycystic Ovary Syndrome (PCOS)** as a global reproductive and metabolic condition. My focus was to explore how PCOS is diagnosed, how it presents across different populations, how infertility is managed in PCOS patients, and how assisted reproductive technologies such as IVF are leading to increased rates of twin and multiple pregnancies among these women. This research journey, built on the review and critical analysis of over 50 peer-reviewed studies, covered six continents, Asia, Africa, North America, South America, Australia and Europe. The study offered me not only academic insight but also personal and professional growth in navigating medical disparities through a global health lens.

The project was structured into **three distinct stages**, each addressing a key pillar in the global PCOS conversation. In the **first stage**, I focused on **analyzing the prevalence of PCOS across regions** using population-based surveys, community screenings, national health datasets and peer-reviewed papers. This involved examining studies conducted in countries including China, India, Iran, Nigeria, Morocco, Brazil, the United States, Canada, the UK, Australia, and more. These studies utilized varying diagnostic frameworks, such as the Rotterdam criteria, the NIH criteria, and the Androgen Excess and PCOS Society guidelines, which made data synthesis both complex and revealing.

What stood out most was the sheer variability in prevalence estimates. For instance, in Asia, prevalence ranged from as low as 5.6% in rural China to as high as 19.6% in urban India, depending on the diagnostic criteria used. South America, a continent less represented in earlier PCOS research, showed unexpectedly high prevalence rates in countries like Brazil and Ecuador, with figures often exceeding 12%, largely driven by

urbanization, rising obesity rates, and shifting reproductive behaviors. In Africa, available data from Nigeria, Morocco, and Sudan suggested prevalence ranging from 9–12%, but these were likely underestimates due to infrastructural gaps and stigma surrounding reproductive health. Europe showed moderate and relatively stable prevalence estimates, but variation still existed between Western and Eastern regions, reflecting differences in public health coverage and awareness. North America, particularly the USA, reported increasing diagnosis rates over time, especially among ethnic minorities and adolescents, pointing to a broader trend of heightened clinical recognition. Australia, meanwhile, maintained a prevalence of around 10% but emerged as a research leader in PCOS management, with Monash University at the forefront of clinical and academic contributions. This stage made clear that PCOS is not only underdiagnosed globally, but inconsistently defined and detected. Diagnostic fragmentation and limited population screening especially in rural and low-income regions - mean we may still not fully grasp the global burden of PCOS. The key question this raised was: how can we meaningfully compare prevalence across regions when the criteria, awareness, and access to care are so unequal?

In the **second stage**, my focus shifted from prevalence to **infertility treatment differences** for PCOS patients around the world. This involved deep-diving into fertility guidelines, randomized controlled trials (RCTs), clinical registries, and regional meta-analyses. My goal was to compare access to treatments such as clomiphene citrate, letrozole, metformin, and IVF, and to assess whether treatment protocols aligned with global best practices.

What became apparent was a stark divide in treatment quality and access. Australia emerged as a model, offering public access to individualized, evidence-based infertility care. National guidelines emphasize lifestyle intervention as the first-line therapy, followed by pharmacologic support (usually letrozole), and finally ART like IVF when needed. Similarly, Europe, through bodies like ESHRE and NICE, promoted regulated, standardized treatment frameworks that balanced clinical effectiveness with public health funding. North America, especially the U.S., offers technologically advanced treatments including IVF, ICSI, and hormone therapies. However, due to the privatized nature of healthcare, access remains inequitable. Insurance gaps and racial disparities

mean that many women, especially from low-income or minority communities, receive suboptimal or delayed care. Asia presented a highly stratified picture: metropolitan areas in China and India offer modern fertility clinics and IVF access, while rural areas suffer from underdiagnosis, social stigma, and over-the-counter misuse of fertility drugs. In South America, infertility treatment remains mostly private, with clomiphene and metformin forming the basis of accessible care. Regulation is weak, and many women turn to unregulated clinics or alternative treatments. Africa, unfortunately, is the most under-resourced in this domain. Access to ART is nearly nonexistent in many regions, and cultural pressures around fertility often overshadow the pursuit of structured care. Importantly, this stage raised ethical and structural questions: why are guidelines so globally unified, yet care delivery so fragmented? What roles do income, geography, culture, and gender stigma play in creating these barriers?

Finally, in the **third stage**, I explored a more nuanced but critical topic: the **role of IVF in contributing to twin or multiple pregnancies among PCOS patients**. This is an understudied yet serious consequence of aggressive ART use in women with PCOS, who often exhibit high ovarian reserve and heightened sensitivity to stimulation drugs like gonadotropins. These biological factors, when combined with financial pressures or unregulated clinical practices, often result in multiple embryos being transferred, which increases the incidence of twin or triplet pregnancies.

Through comparative review of IVF registry data from the U.S., China, India, Iran, and Europe, I found that twin pregnancy rates in PCOS IVF cycles ranged from **25% to 32%**, with the highest rates in countries lacking strict embryo transfer policies. In contrast, Europe and Australia have adopted elective single embryo transfer (eSET) policies to minimize this risk, successfully bringing rates closer to 10–15%. This stage also addressed the maternal and neonatal health risks associated with multiple pregnancies in PCOS: preeclampsia, gestational diabetes, preterm labor, and NICU admissions were all more common. This finding introduced a critical bioethical tension: should success rates or safety outcomes take priority in fertility care? How can patient pressure and clinical competition be ethically balanced?

Throughout the project, I faced several technical and methodological challenges. The lack of uniform diagnostic criteria across studies made direct comparison difficult.

Many studies lacked detailed demographic breakdowns, and several important regional papers were paywalled or not translated into English. In regions like rural South Asia or Sub-Saharan Africa, prevalence and treatment data were sometimes completely missing, forcing reliance on isolated hospital-based studies. Additionally, registries often excluded socioeconomic data, limiting the ability to analyze how poverty or cultural factors affect PCOS management. These barriers required me to triangulate findings, build visual comparisons, and often critically question the conclusions I was reading.

Despite the challenges, the project was deeply rewarding. I learned how to conduct a rigorous literature review at scale, synthesize findings across disciplines, and evaluate medical data through a socioeconomic and cultural lens. I developed skills in organizing complex information by region, creating comparative visuals, and identifying gaps in research and care. Perhaps more importantly, this research made me profoundly aware of how health inequality, not just disease biology, determines outcomes for women with PCOS.

Several key concerns remain with me as I close this project. Why are so many women, even in urban centers, unaware of their PCOS diagnosis? Why are infertility treatments still so financially inaccessible or medically outdated in certain countries? Why do global guidelines exist, but fail to translate into meaningful, equitable care for millions of women? And how can we ensure that emerging therapies like microbiome interventions, inositol supplements, or personalized hormone therapy are tested and made available across diverse populations, not just in high-income countries?

In conclusion, this research did more than collect and compare numbers, it illuminated the invisible disparities and systemic shortcomings surrounding PCOS care worldwide. It showed that PCOS is not just a hormonal disorder, but a global health issue shaped by politics, economics, and social justice. It made clear that solving PCOS requires more than medical advances, it requires policy change, community education, and culturally tailored care models. This project has not only strengthened my academic curiosity but has fueled a deeper commitment to advocating for reproductive equity and global women's health in my future work.