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THE IMPACT OF POLYCYSTIC OVARY SYNDROME (PCOS) ON FEMALE FERTILITY: A REVIEW OF CURRENT LITERATURE

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Abstract

Polycystic ovarian syndrome (PCOS) remains the most common endocrine illness in reproductive-aged women and a major contributor to an ovulatory infertility globally. The burden of infertility is caused by a combination of metabolic and hormonal disturbances, most notably insulin resistance, hyper-insulinemia, and hyper-androgenism, which affect follicular recruitment, ovulation, oocyte competence, and endometrial receptivity. Contemporary diagnostic paradigms, based on the Rotterdam criteria, priorities phenotypic segmentation to facilitate individualized care. Current data supports lifestyle modification as a universal first-line strategy, highlighting its ability to restore ovulation and reduce cardiometabolic risks. Letrozole has emerged as the more effective ovulation-inducing medication than clomiphene citrate, while metformin, low-dose gonadotropins, and laparoscopic ovarian drilling continue to play supporting roles. For refractory instances, assisted reproductive technologies (IVF/ICSI) offer successful solutions, with protocols optimized to reduce ovarian hyper stimulation syndrome (OHSS). Beyond conception, PCOS pregnancies are encumbered by heightened risks of hypertensive disorders and gestational diabetes, necessitating vigilant preconception optimization and individualized antenatal surveillance. This narrative synthesis integrates evolving mechanistic insights, diagnostic refinements, and therapeutic hierarchies from the 2023 International Guideline and contemporary literature, framing PCOS as not only a reproductive disorder but also a systemic condition requiring holistic, multidisciplinary management.

Keywords: *Polycystic ovary syndrome, infertility, ovulation induction, letrozole, insulin resistance, assisted reproduction, infertility*

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is more than just a gynaecological curiosity; it is a model of how endocrine and metabolic dysregulation can interact with reproductive health to produce a wide range of

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clinical outcomes. It is the most frequent endocrinopathy in reproductive-aged women, affecting 8-13% of the population, though estimates vary greatly depending on the diagnostic criteria used and the cohort's ethnic origin (Bozdag et al., 2016; Teede et al., 2018). What makes PCOS so difficult is its variability; symptoms can range from minor monthly abnormalities and mild hyperandrogenism to deep anovulation, infertility, and major metabolic dysfunction. This variety hampers not only diagnosis but also the tailoring of treatment techniques to specific individuals.

From a reproductive standpoint, PCOS is unquestionably the major cause of anovulatory infertility, accounting for roughly 70-80% of instances in women with subfertility (Fauser et al., 2012). The syndrome's effects on fertility are mostly due to disordered folliculogenesis, hormonal imbalance, and metabolic dysregulation. At the molecular level, insulin resistance and compensatory hyperinsulinemia increase ovarian theca-cell androgen synthesis while inhibiting hepatic sex hormone-binding globulin (SHBG), aggravating free androgen exposure (Dumesic et al., 2015). Elevated circulating androgens, in turn, disrupt granulosa cell activity and dominant follicle selection, causing the characteristic "follicular arrest" seen on ultrasonography.Concomitantly, neuroendocrine disturbances, most notably increased luteinizing hormone (LH) pulse frequency relative to follicle-stimulating hormone (FSH), further skew follicular maturation, producing cycles that are either oligo-ovulatory or anovulatory (Azziz et al., 2016).

However, the reproductive impairment of PCOS goes beyond anovulation. Women with PCOS may have poor oocyte competence, delayed embryo development, and decreased endometrial receptivity, all of which contribute to low fertility even when assisted reproductive technologies (ART) are used (Rashidi et al., 2018). Chronic hyperandrogenemia, low-grade inflammation, and metabolic derangements may all alter the endometrial environment, predisposing certain phenotypes to implantation failure or early pregnancy loss. Thus, PCOS-related infertility is best seen as a complex combination of ovarian, metabolic, and endometrial dysfunctions.

Since the 2003 Rotterdam consensus, which expanded diagnostic parameters by requiring two of three core features, oligo-/anovulation, clinical or biochemical hyperandrogenism, and polycystic ovarian morphology, after excluding related conditions, PCOS has been defined as a syndrome rather than a uniform disease entity (Rotterdam ESHRE/ASRM, 2004). While broadening the definition increased recognition, it also created diagnostic heterogeneity, with phenotypes ranging from "classic" PCOS (hyperandrogenic with oligo-anovulation) to "non-hyperandrogenic" variants. Such variation has clinical implications: hyperandrogenic phenotypes, for example, tend to have more pronounced metabolic abnormalities and lower reproductive outcomes than their normoandrogenic counterparts (Teede et al., 2018). More recently, the 2023 International Evidence-Based Guideline has refined diagnostic approaches, calling for improved assay standardisation for androgens, re-evaluation of ultrasound thresholds in adolescents, and consideration of phenotype-specific treatment strategies (Teede et al., 2023).

Although infertility is frequently the presenting concern, PCOS is increasingly understood as a systemic disorder that goes far beyond reproduction. Women with PCOS have an increased risk of metabolic syndrome, type 2 diabetes, dyslipidaemia, and cardiovascular dysfunction (Azziz et al., 2016; Teede et al., 2018). These dangers are more than just academic; they affect reproductive planning and pregnancy outcomes. For example, pregnancies in women with PCOS are disproportionately affected by gestational diabetes, hypertensive diseases, and premature birth, underlining the link between preconception metabolic health and obstetric outcomes (Roos et al., 2011). Thus, a modern treatment to PCOS-related infertility must include not only ovulation stimulation but also cardiometabolic health optimization prior to pregnancy.

Over the last decade, there have been substantial paradigm developments in the treatment of PCOS-related infertility. Lifestyle change remains the cornerstone of treatment, with even minor weight loss demonstrated to restore ovulatory cycles in overweight or obese women (Moran et al., 2011). Pharmacologically, the field has turned away from

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clomiphene citrate, which was formerly the mainstay of ovulation induction, and towards letrozole, an aromatase inhibitor with higher ovulation, pregnancy, and live-birth rates and a better safety profile (Legro et al., 2014).

Adjunctive medications like as metformin are used mostly in women with metabolic disorders or glucose intolerance, while their effectiveness in delivering live delivery remains limited. For women who are unresponsive to oral agents, low-dose gonadotropin protocols and, in some cases, laparoscopic ovarian drilling (LOD) are second-line interventions, with careful consideration given to reducing the risks of multiple gestation and ovarian hyper stimulation syndrome (OHSS) (Teede et al., 2023). When these options fail or additional infertility factors are identified, assisted reproductive technologies such as in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) are highly effective; however, they require tailored stimulation protocols to minimize OHSS, a complication to which women with PCOS are particularly vulnerable(Sunkara et al., 2015).

PCOS is not only a biological illness; it also has important psychosocial implications. Women with PCOS have greater rates of anxiety, depression, and lower quality of life, which is typically compounded by infertility and the treatment process (Dokras et al., 2011). These psychological elements are not incidental; they influence therapy adherence, patient satisfaction, and total reproductive outcomes. Modern guidelines highlight comprehensive care, recommending routine mental health screening and integrated psychosocial assistance in addition to medical management (Teede et al., 2023).

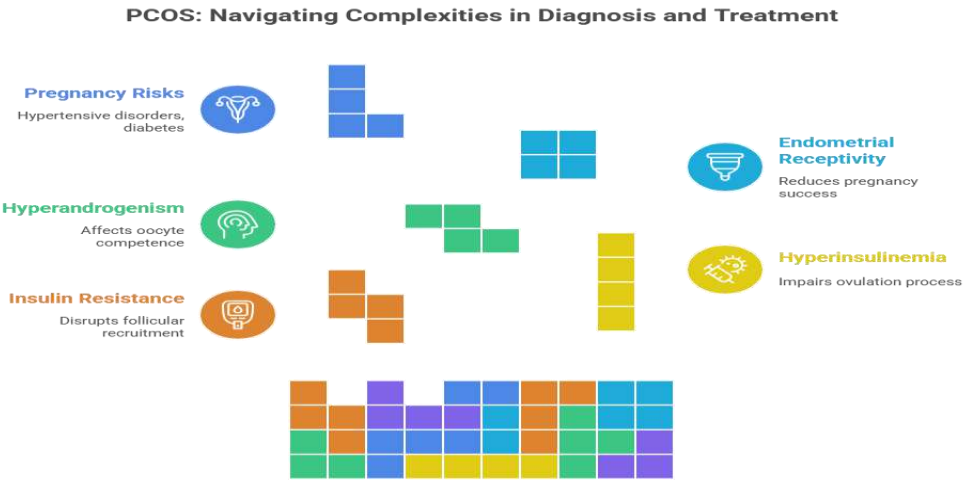
PCOS is a unique junction of endocrinology, gynecology, and reproductive medicine due to its incidence, heterogeneity, and long-term repercussions. Its effects on fertility are profound and multifaceted, including anovulation, decreased oocyte competency, endometrial dysfunction, and increased pregnancy problems. At the same time, treatment tactics are fast developing, with new findings redefining clinical hierarchies and questioning long-held traditions.

The purpose of this review is to objectively evaluate the complex relationship between polycystic ovarian syndrome (PCOS) and female infertility, focusing on the hormonal, metabolic, and reproductive mechanisms that cause subfertility in affected women. It aims to synthesize current knowledge of how insulin resistance, hyperinsulinemia, and androgen excess affect follicular maturation, ovulation, oocyte competence, and endometrial receptivity. In doing so, the review assesses the developing diagnostic techniques utilized in fertility settings, emphasizing the significance of phenotype-specific assessments in directing treatment. Another key goal is to evaluate therapy options ranging from lifestyle therapies and first-line ovulation stimulation to sophisticated reproductive technologies, taking into account both efficacy and safety.Beyond conception, the review aims to illuminate the broader reproductive, metabolic, and psychosocial challenges faced by women with PCOS, thereby advocating for a holistic, multidisciplinary framework of care.

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Graphical Abstract, The Impact of Polycystic Ovary Syndrome (PCOS) on Female Fertility: A Review of Current Literature

Pathophysiology Linking PCOS to Infertility

1. Hormonal and Metabolic Imbalances

PCOS is caused by a complex interplay of hormonal and metabolic abnormalities that disrupt normal ovarian function. Insulin resistance, a defining trait of the syndrome, drives compensatory hyperinsulinemia. Elevated insulin levels work in tandem with luteinizing hormone (LH) to stimulate theca cell androgen production in the ovary while simultaneously inhibiting hepatic synthesis of sex hormone-binding globulin (SHBG), increasing the pool of biologically active free androgens (Dumesic et al., 2015; Azziz et al., 2016). This hyperandrogenic environment has serious consequences: granulosa cell function is impaired, aromatase activity is reduced, and the delicate process of follicular maturation is halted at the small antral stage, resulting in the polycystic ovarian morphology seen on ultrasound. Beyond the ovary, neuroendocrine perturbations also play a pivotal role. Women with PCOS exhibit a characteristically increased GnRH pulse frequency, which preferentially drives LH hypersecretion at the expense of follicle-stimulating hormone (FSH). This imbalance further undermines dominant follicle selection, perpetuating cycles of oligo-ovulation or anovulation (Fauser et al., 2012; Teede et al., 2018). Thus, the combined burden of insulin resistance, androgen excess, and hypothalamic-pituitary misregulation forms the endocrine backbone of infertility in PCOS.

2. Ovulatory Dysfunction and Endometrial Effects

The downstream reproductive consequences of these hormonal and metabolic aberrations are wide-ranging. The most direct mechanism is ovulatory dysfunction, with many women experiencing chronic oligo-ovulation or complete anovulation, which explains why PCOS accounts for nearly 70-80% of anovulatory infertility cases (Fauser et al., 2012). However, the impairment is not confined to ovulation alone. A growing body of evidence suggests that oocyte quality may also be compromised, with hyperinsulinemia and lipotoxicity creating an intra-follicular environment that jeopardizes mitochondrial function and meiotic competence (Rashidi et al., 2018). Even when fertilization occurs, the endometrium may present an inhospitable landscape for implantation. Chronic hyperandrogenism, coupled with low-grade inflammation and metabolic dysregulation, can disturb the expression of key receptivity markers, impair endometrial remodeling, and desynchronize the implantation window (Dumesic et al., 2015). These abnormalities contribute to reduced natural fecundity and may increase the risk of early pregnancy loss in certain PCOS phenotypes.

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Collectively, these insights underscore that infertility in PCOS is not merely a matter of absent ovulation but rather the outcome of a multisystem interplay involving ovarian, metabolic, and endometrial dysfunctions (Figure 1).

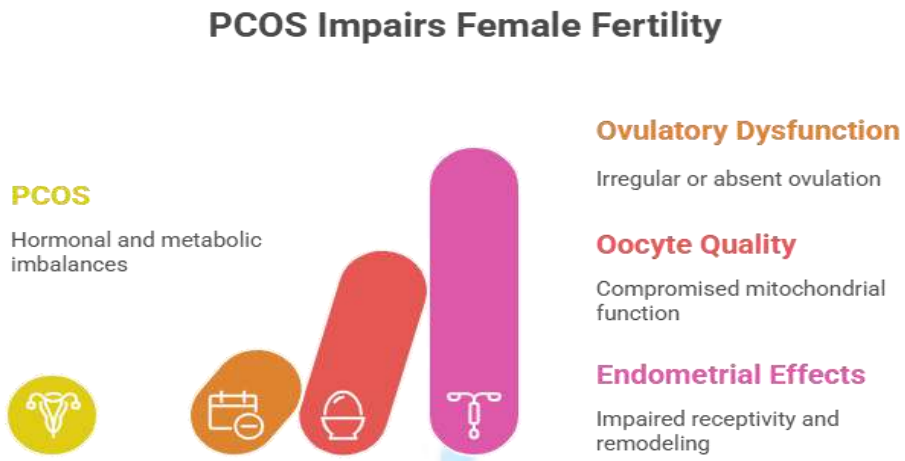


Figure 1: Pathophysiology Linking PCOS to Infertility

Diagnosis in the Fertility Setting

The Rotterdam criteria, which require the presence of at least two out of three features: (i) oligo- or anovulation, (ii) clinical or biochemical hyperandrogenism, and (iii) polycystic ovarian morphology on ultrasound, after exclusion of other aetiologies such as thyroid dysfunction, hyperprolactinemia, nonclassic congenital adrenal hyperplasia, and androgen-secreting tumours (Rotter While this approach expanded the definition of the condition, it also brought significant phenotypic variation, ranging from "classic" hyperandrogenican ovulatory PCOS to milder ovulatory variants. This variability is not only academic; it has crucial prognostic implications, as women with hyperandrogenic phenotypes tend to have more pronounced metabolic derangements and lower reproductive outcomes compared to their normo-androgenic counterparts (Teede et al., 2018).

Recent advice aimed to improve diagnostic precision in fertility settings. Notably, the 2023 International Evidence-Based Guideline emphasized the importance of improving androgen assay standardization, acknowledging that variability in laboratory techniques continues to erode diagnostic reliability (Teede et al., 2023). Similarly, ultrasonography limits for identifying polycystic ovarian morphology have been reconsidered, particularly in teens, where large antral follicle counts may indicate normal physiology rather than disease. Beyond these modifications, a trend towards phenotype-based stratification has evolved, in which diagnostic subgroups (e.g., anovulatory vs. ovulatory PCOS) are increasingly used to guide therapy selection, predict responsiveness to ovulation induction, and counsel couples regarding prognosis (Azziz et al., 2016). Taken together, these advances underscore that the diagnosis of PCOS in infertility care is evolving from a rigid, checklist-based approach toward a more nuanced, individualized model that integrates clinical, biochemical, and sonographic data within the broader reproductive and metabolic context.

How PCOS Impairs Fertility

The processes by which PCOS impairs fertility are diverse, going far beyond the obvious issue of ovulatory disruption. Anovulation remains the primary cause, with persistent inability to recruit and release a dominant follicle accounting for the vast

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majority of subfertility cases in this cohort (Fauser et al., 2012). However, the reproductive impairment associated with PCOS cannot be attributed solely to anovulation. Emerging data suggests that the quality of oocytes and embryos may also be harmed. Hyperinsulinemia and the lipotoxic intra-follicular milieu of PCOS disrupt mitochondrial dynamics, meiotic spindle formation, and cytoplasmic maturation, reducing developmental competence (Dumesic et al., 2015; Rashidi et al., 2018).

The endometrium is another important location of malfunction. Endometrial receptivity is disrupted by chronic hyperandrogenism, metabolic derangements, and low-grade inflammation, which reduce progesterone responsiveness, change integrin expression, and desynchronise the implantation window. In addition, poor cervical mucus quality has been recorded which may impede spontaneous conception by limiting sperm movement (Azziz et al., 2016).

PCOS is typically accompanied by systemic comorbidities, which exacerbate these reproductive-specific mechanisms. Obesity, insulin resistance, and dysglycemia all have a deleterious impact on fertility, mostly through lipotoxicity and glucotoxicity, but also by increasing pregnancy risks. Women with PCOS are more likely to develop gestational diabetes, hypertensive problems, and premature birth, indicating a direct relationship between preconception metabolic condition and unfavourable obstetric outcomes (Teede et al., 2018; Roos et al., 2011).

Table 1: Mechanism pathophysiological basis of clinical consequences

Anovulation	Disrupted folliculogenesis due to LH hypersecretion, insulin resistance, and androgen excess	Oligo-/anovulation is the leading cause of infertility in PCOS
Oocyte and embryo quality	Hyperinsulinemia and lipotoxic intra-follicular environment impair mitochondrial and meiotic competence	Reduced fertilization, impaired embryo development, lower live-birth rates in some cohorts
Endometrial dysfunction	Hyperandrogenism, inflammation, and altered integrin/progesterone signaling desynchronize implantation window	Reduced endometrial receptivity, implantation failure, early pregnancy loss
Cervical mucus changes	Altered hormonal milieu impacts mucus composition	Impaired sperm penetration and transport
Systemic comorbidities	Obesity, insulin resistance, and dysglycemia create hostile metabolic environment	Lower fecundity; increased risks of gestational diabetes, hypertension, and preterm birth

Evaluation of the Infertile Patient with PCOS

While PCOS is a well-known cause of anovulatory infertility, a diagnosis does not eliminate the necessity for a thorough infertility evaluation. Standard assessment remains crucial for avoiding diagnostic overshadowing. A semen study is essential for the pair, as male factor infertility accounts for roughly 40-50% of cases worldwide (Agarwal et al., 2021). Similarly, uterine cavity evaluation and tubal patency testing using hysterosalpingography, sonohysterography, or laparoscopy should be considered, particularly in women with risk factors such as previous pelvic inflammatory illness, endometriosis, or pelvic surgery (ASRM Practice Committee, 2021).

Beyond reproductive architecture and gamete function, women with PCOS have a unique metabolic profile that requires special attention. These patients frequently have a combination of cardiometabolic concerns, such as obesity, insulin resistance, dyslipidaemia, and hypertension, which affects both fertility therapy success and pregnancy safety. Recent international evidence-based guidelines (2023 update) emphasize the necessity of

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preconception cardiometabolic screening, specifically advocating routine measurements of blood pressure, BMI, lipid profile, and glucose tolerance. Early detection of metabolic abnormalities not only improves fertility therapies, but also lowers the risk of gestational diabetes, pre-eclampsia, and other obstetric problems (Palomba et al., 2021).

Management Strategies for Infertility in PCOS

The management of infertility in women with PCOS requires a stepwise, evidence-based approach that balances efficacy with safety, while also considering the metabolic and cardiometabolic context of each patient. Recent guidelines stress that therapy should begin with foundational lifestyle optimization and then proceed to targeted ovulation induction strategies, escalating to advanced assisted reproductive techniques only when necessary (Legro et al., 2014; Teede et al., 2018).

1. Foundational therapy: Lifestyle and metabolic optimization

Lifestyle modification remains the cornerstone of management. Women with PCOS should receive individualized counseling on nutrition, exercise, sleep hygiene, and weight management. Even a modest weight loss of 5–10% in those with excess adiposity has been shown to restore ovulation and improve spontaneous conception rates (Moran & Norman, 2019). Parallel attention to insulin resistance, dysglycemia, and cardiometabolic health is essential, since optimizing metabolic health not only enhances fertility outcomes but also reduces pregnancy risks such as gestational diabetes and pre-eclampsia (Teede et al., 2023).

2. First-line ovulation induction: Letrozole

Letrozole, an aromatase inhibitor, is now widely endorsed as the first-line pharmacologic therapy for anovulatory infertility in PCOS. By reducing estrogen synthesis, letrozole enhances intraovarian FSH activity, thereby promoting mono-follicular recruitment and development. Multiple randomized trials and meta-analyses have confirmed its superiority over clomiphene citrate, with higher ovulation, clinical pregnancy, and live birth rates, while maintaining a comparable safety profile (Franik et al., 2018; Legro et al., 2014). Standard regimens involve 2.5–5 mg daily for 5 days early in the cycle, with dose escalation based on response and cycle monitoring.

3. Role of clomiphene citrate and metformin

Clomiphene citrate, historically the mainstay of ovulation induction, remains a reasonable option when letrozole is unavailable or contraindicated. However, resistance is common, and its anti-estrogenic endometrial effects may reduce implantation rates (Johnson, 2014). Metformin, an insulin-sensitizing agent, plays a complementary role: it improves ovulatory function in insulin-resistant women and is particularly beneficial in those with impaired glucose tolerance or overt metabolic syndrome. Nonetheless, as a sole first-line agent for live birth, metformin is generally inferior to letrozole or clomiphene (Costello et al., 2019).

4. Second-line therapy: Low-dose gonadotropins

For women who do not respond to oral ovulation induction, low-dose gonadotropin regimens are considered the next step. Step-up FSH protocols are designed to achieve mono-follicular ovulation while reducing the risk of multiple gestation and ovarian hyperstimulation syndrome (OHSS). Clinical guidelines recommend antagonist cycles with careful dose titration and close ultrasound and estradiol monitoring (ASRM, 2020).

5. Laparoscopic ovarian drilling (LOD) in selected cases

LOD is a surgical alternative for women with PCOS who are resistant to oral ovulation induction. By ablating portions of the ovarian stroma, LOD reduces intraovarian androgen production and may restore ovulation in some patients (Farquhar et al., 2012). However, its invasive nature and the potential to compromise ovarian reserve limit its use. Evidence comparing LOD with letrozole or gonadotropins is mixed, and thus patient selection is critical.

6. Assisted reproduction (IVF/ICSI)

When first- and second-line therapies fail, or when additional infertility factors (such as tubal disease or male factor infertility) coexist, in vitro fertilization (IVF) offers a highly effective route to conception.

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Given the heightened OHSS risk in PCOS, tailored stimulation strategies are crucial: GnRH antagonist protocols, GnRH agonist trigger for oocyte maturation, and "freeze-all" embryo approaches have emerged as best practices (ESHRE Guideline Group, 2022). Intracytoplasmic sperm injection (ICSI) is reserved for cases with concurrent male factor infertility (Figure 2).

Table 2: Management Strategies for Infertility in PCOS and key considerations

Strategy	Mechanism / Rationale	Clinical Application	Key Considerations
Foundational therapy: Lifestyle & metabolic optimization	Improves insulin sensitivity, reduces hyperandrogenism, restores ovulation	Nutrition, physical activity, sleep hygiene, weight reduction (even 5-10% loss beneficial)	Address cardiometabolic risks before fertility treatment
First-line ovulation induction: Letrozole	Aromatase inhibition ↑ intraovarian FSH signaling → mono-follicular development	2.5-5 mg/day for 5 days, dose escalate with cycle monitoring	Superior to clomiphene for ovulation, pregnancy & live birth; guideline-recommended
Clomiphene citrate	Selective estrogen receptor modulator → ↑ FSH secretion	Alternative when letrozole unavailable/contraindicated	Risk of multiple pregnancy; less effective than letrozole
Metformin (adjunct)	Enhances insulin sensitivity, reduces hepatic glucose production	Useful in women with impaired glucose tolerance/metabolic syndrome	Inferior to letrozole for live birth; often combined with other agents
Second-line: Low-dose gonadotropins	Exogenous FSH stimulates folliculogenesis	Step-up protocols for letrozole-resistant cases	Requires intensive monitoring; minimize risk of OHSS and multiple pregnancy
Laparoscopic ovarian drilling (LOD)	Ablates androgen-producing stroma → improves ovulation	Reserved for clomiphene/letrozole-resistant women	Invasive; may reduce ovarian reserve; mixed evidence vs. medical induction
Assisted reproduction (IVF/ICSI)	Bypasses ovulatory dysfunction & other infertility factors	For failure of prior strategies or co-existing factors (tubal, male factor)	OHSS risk high in PCOS → use antagonist cycles, agonist trigger, freeze-all approach when needed

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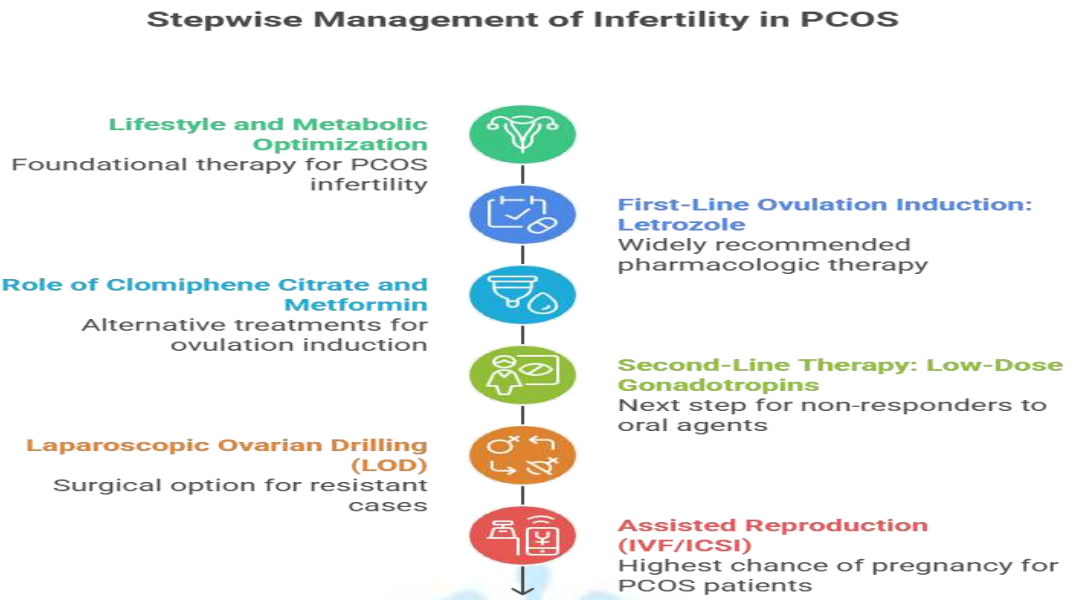


Figure 2: Step wise Management Strategies for Infertility in PCOS

Pregnancy and Perinatal Risks in PCOS

Women with polycystic ovary syndrome have a number of reproductive and metabolic problems that last beyond conception and into pregnancy. A consistent body of evidence shows that PCOS is linked to an increased risk of hypertensive disorders of pregnancy, such as gestational hypertension and pre-eclampsia, as well as gestational diabetes mellitus (GDM), though the magnitude of risk varies by population and study design (Palomba et al., 2015; Boomsma et al., 2006; Joham et al., 2014). The pathogenesis is thought to be the result of chronic insulin resistance, hyperandrogenism, obesity, and endothelial dysfunction, all of which impair maternal vascular adaptation to pregnancy.

Recent meta-analyses and cohort studies support these findings, but heterogeneity remains due to varying diagnostic criteria and correction for confounding factors (Roos et al., 2011; Yu et al., 2016). Importantly, the 2023 worldwide PCOS guideline emphasises the importance of preconception blood pressure monitoring and individualised prenatal surveillance based on cardiometabolic risk (Teede et al., 2023). Weight management, glycaemic control, and early screening for gestational diabetes are all feasible interventions that can help reduce risk. In selected women at high cardiovascular risk, low-dose aspirin prophylaxis and personalised metabolic control should be explored in accordance with local obstetric procedures (NICE, 2021).

Psychosocial Considerations

Polycystic ovarian syndrome has far-reaching consequences for mental health and quality of life. Women with PCOS typically report increased rates of anxiety, depression, body image issues, and low self-esteem, which are frequently exacerbated by the chronicity of symptoms such as hirsutism, acne, monthly abnormalities, and infertility (Dokras et al., 2011; Cooney et al., 2017). Infertility therapy adds an additional psychological load of hope and disappointment, invasive treatments, financial stress, and social shame, all of which can exacerbate emotional discomfort (Figure 3).

Recognizing this, the 2023 worldwide PCOS guideline emphasizes comprehensive care, including routine psychosocial assessment, open dialogue, and early referral to mental health providers (Teede et al., 2023). Structured assistance, such as cognitive behavioral therapy, stress-reduction techniques, and peer-support groups, can dramatically enhance coping and treatment adherence (Dokras, 2016). Furthermore, encouraging compassionate clinician-

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patient communication and acknowledging the emotional experience of PCOS are crucial stages in reproductive planning and long-term care (Figure 3).

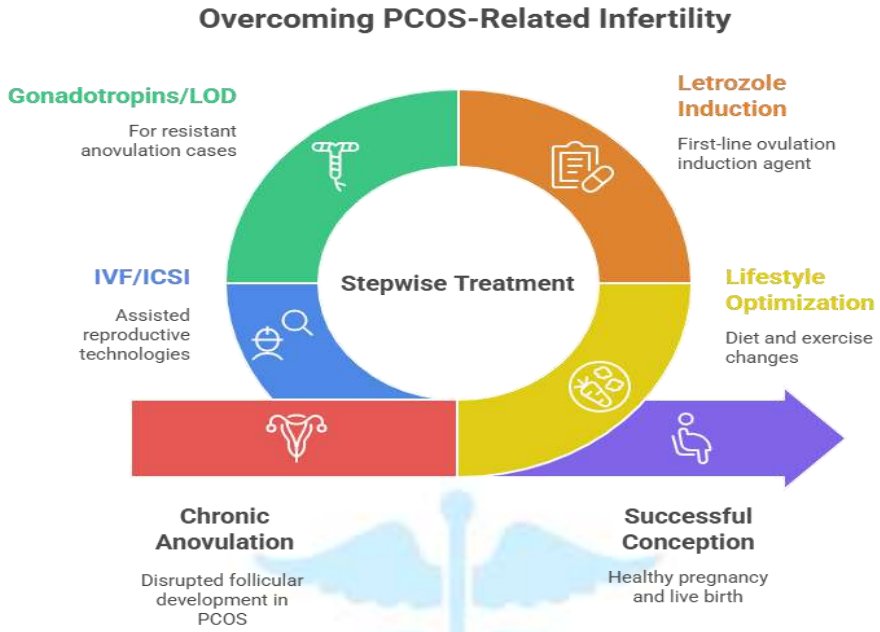


Figure 3: Overcoming PICOS related Infertility, Stepwise Treatment

Conclusions

Infertility in women with PCOS is mostly caused by chronic anovulation, which is characterised by an interaction of androgen excess, insulin resistance, and disturbed follicular development. Effective care necessitates a step-by-step, individualized approach, beginning with lifestyle optimization as the foundation, progressing to letrozole as the chosen first-line ovulation induction drug, and progressing to gonadotropins or laparoscopic ovarian drilling (LOD) in resistant instances. For women who are still anovulatory or have additional infertility issues, assisted reproductive technologies (IVF/ICSI) combined with modern OHSS-prevention techniques provide high cumulative live-birth rates while ensuring patient safety. Importantly, management must go beyond idea. The elevated cardiometabolic and obstetric risks associated with PCOS, including gestational diabetes and hypertensive disorders of pregnancy, necessitate proactive preconception optimization and vigilant antenatal monitoring. Equally vital is attention to the psychological burden of PCOS, ensuring that mental health support is integrated into fertility care.

Future perspectives

Despite tremendous progress in understanding and treating PCOS-related infertility, significant information gaps remain. Future research should concentrate on phenotype-specific medicines, acknowledging that women with mainly metabolic, androgenic, or ovulatory phenotypes may react differently to current medications. Tailoring interventions, whether lifestyle, pharmaceutical, or assisted reproductive, could increase efficacy while reducing exposure to unsuccessful therapies. Improved live-birth outcomes, which are the most patient-centered measure of success, must be prioritised over surrogate endpoints such as ovulation or biochemical pregnancy. Assisted reproduction technologies should continue to evolve towards "safer stimulation" tactics, incorporating antagonist cycles, agonist triggers, and freeze-all

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protocols when needed.The wider implementation of the 2023 international guideline is critical to harmonize practice worldwide. Standardization of androgen assays, imaging thresholds, and clinical definitions will strengthen research comparability and clinical decision-making, ultimately improving the quality and consistency of care for women with PCOS.

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