WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.63
Volume 15, Issue 9, 482-490. Review Article ISSN 2277–7105

POLYCYSTIC OVARY SYNDROME: A REVIEW ARTICLE

Dr. Gargi Pathak*[1], Dr. Twinkle Varshney[2], Dr. Mamta Kumari Swain[3]

[1]PG Scholar, [2]PG Scholar Dept. of Prasuti Tantra Evum Stree Roga Jeevan Jyoti Ayurvedic Medical College & Hospital.

[3]HOD & Professor, Dept. of Prasuti Tantra Evum Stree Roga Jeevan Jyoti Ayurvedic Medical College & Hospital.

Article Received on 02 April 2026,
Article Revised on 22 April 2026,
Article Published on 01 May 2026,

https://doi.org/10.5281/zenodo.19875452

***Corresponding Author**

Dr. Gargi Pathak
PG Scholar, Dept. of Prasuti Tantra Evum Stree Roga Jeevan Jyoti Ayurvedic Medical College & Hospital.

How to cite this Article: Dr. Gargi Pathak*[1], Dr. Twinkle Varshney[2], Dr. Mamta Kumari Swain[3] (2026). Polycystic Ovary Syndrome: A Review Article. World Journal of Pharmaceutical Research, 15(9), 482–490.

ABSTRACT

Polycystic ovary syndrome (PCOS) is a hormonal and gynecological disorder that affects many women of reproductive age. Although some mechanisms involved in its development are known, its exact cause and how it works are still not fully understood. Women with PCOS often have long-term lack of ovulation and high levels of male hormones as main hormonal features. This condition can affect females from conception to death, posing various health risks and thereby reducing quality of life. PCOS symptoms usually start during early puberty. Irregular periods and lack of ovulation can be seen in both PCOS and normal puberty in girls. Depending on the diagnostic criteria used, approximately 6%–22% of women of reproductive age are estimated to be affected by PCOS. As long as Polycystic Ovary Syndrome remains a syndrome rather than a single disease, no individual sign such as elevated androgen levels (hyperandrogenism) or the presence of polycystic ovaries can be relied upon alone for a definitive clinical diagnosis. The management of women with PCOS is based on the specific symptoms they present. These may include menstrual irregularities, androgen-related symptoms, or infertility due to ovulatory dysfunction. In females with PCOS, anovulation is associated with low follicle-stimulating hormone (FSH) levels and arrest of antral follicle growth in the final stages of maturation. The condition can be treated surgically with laparoscopic ovarian drilling or medically using agents such as aromatase inhibitors, metformin, glucocorticoids, clomiphene citrate (CC), tamoxifen, or gonadotropins. Patients

may present with varying androgenic symptoms, including hirsutism, acne, and/or alopecia. Those experiencing these distressing symptoms require appropriate management. This review highlights its role in the management of various clinical conditions."

KEYWORDS: polycystic ovary syndrome; hyperandrogenism; insulin resistance; molecular mechanisms; management; repurposing drugs.

INTRODUCTION

Worldwide, polycystic ovary syndrome (PCOS) is a heterogeneous endocrine disorder affecting many women of reproductive age, characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology (PCOM).[1] Depending on the diagnostic criteria used, the reported prevalence of PCOS in the general population is approximately 6%–10%.[2] This syndrome is often associated with enlarged, dysfunctional ovaries, and insulin resistance, among other features.[3] It is estimated that about 1 in 10 women develop **PCOS (Polycystic Ovary Syndrome)** before menopause and struggle with its complications.[4] Although a high luteinizing hormone (LH) to follicle-stimulating hormone (FSH) ratio and increased gonadotropin-releasing hormone (GnRH) pulsatility are known to be underlying causes of PCOS[5], the exact etiology and pathology have not been comprehensively well-known. Evidence suggests the role of different external and internal factors, including insulin resistance (IR), hyperandrogenism (HA), environmental factors, genetic, and epigenetics. In addition, it is important to note that PCOS increases the risk of complications such as cardiovascular disease, type 2 diabetes mellitus, metabolic syndrome, depression, and anxiety.[6] Given that PCOS is an increasingly common condition associated with several undesirable complications, and that current treatment options are not fully effective, it is essential to carefully investigate its pathogenesis and identify new pharmacological targets."

METHODS

PubMed, ScienceDirect, Google Scholar, TRIP Database, and UpToDate were systematically searched for publications related to PCOS using relevant keywords, with a focus on recent studies (since 2016). Studies not published in English and animal studies were excluded. In addition, ClinicalTrials.gov was searched to identify data on completed or ongoing clinical trials of repurposed drugs for PCOS over the past five years.

Diagnosis

Polycystic ovarian syndrome (PCOS) cannot be confirmed using routine tests like blood tests, cultures, or biopsy, so there is no specific test to diagnose it. Differential diagnosis is called excluding the relevant disorders according to the symptoms and narrowing the choices. In order to establish a differential diagnosis for PCOS, conditions such as hyperprolactinemia, thyroid disorders, Cushing's syndrome, and adrenal hyperplasia should be excluded based on appropriate investigations.[7,8] Although taking a detailed medical history, including weight changes and symptoms of insulin resistance, can be helpful, pelvic examination, transvaginal ultrasound, and hormone level assessment are among the most commonly recommended investigations.[9]

Causes and Risk Factors

It is difficult to identify the exact causative factors of this multifactorial condition due to its complex and interconnected pathophysiology. The development, prevalence, and expression of the PCOS phenotype may be influenced by environmental pollutants, diet and lifestyle factors, genetic predisposition, obesity, and gut dysbiosis. These factors may contribute to excessive ovarian androgen secretion, the development of insulin resistance, partial arrest of folliculogenesis, and chronic low-grade release of inflammatory mediators from immune cells, thereby increasing the risk of metabolic syndrome.

1. Environmental Toxicants

According to the USEPA, endocrine-disrupting chemicals (EDCs) are external substances that interfere with how hormones are made, released, carried, and function in the body. This interference can affect important body processes such as balance (homeostasis), reproduction, growth and development, and behavior.[10]

2. Physical and Emotional Stress

Although evidence on the role of stress in PCOS remains limited, PCOS is known to negatively impact psychological well-being and self-esteem. Chronic stress promotes adipocyte hypertrophy and hyperplasia through glucocorticoid-mediated maturation of pre-adipocytes. In addition, it is associated with increased adipokine secretion and the recruitment and activation of stromal immune cells within adipose tissue.[11] Furthermore, it promotes inflammation by elevating cytokines like IL-6 and TNF-α and disturbing the balance between oxidants and antioxidants.

3. Role of Genes and Genetics

PCOS is a polygenic and complex disorder, and evidence suggests that specific genes, gene–gene interactions, and gene–environment interactions may influence an individual's susceptibility to developing PCOS.[12]

4. Role of Diet and Lifestyle

Lifestyle changes are the first-line treatment for women with PCOS, but they should not replace medical treatments. Regular exercise, maintaining a healthy weight, eating a balanced diet, and avoiding tobacco are important for preventing and managing metabolic diseases, and are recommended in clinical guidelines for many conditions.

A high-calorie diet and a sedentary lifestyle may worsen PCOS. Diets high in sugar may contribute to PCOS by changing gut bacteria, increasing inflammation, raising insulin resistance, and boosting androgen levels. Obesity and weight gain can make the main symptoms of PCOS worse. Compared to high-glycemic index (HGI) diets, low-glycemic index (LGI) diets help reduce fasting insulin, total cholesterol, LDL cholesterol, triglycerides, waist circumference, and total testosterone in women with PCOS, without significantly changing fasting glucose, HDL cholesterol, body weight, or the free androgen index.

Pathophysiology

Androgen excess is a significant feature of PCOS, present in approximately 60%–80% of affected individuals. Elevated androgen production may lead to manifestations such as hirsutism and other features of hyperandrogenism. Indeed, hyperandrogenism is the most prevalent abnormality observed in PCOS and contributes substantially to the hormonal disturbances involved in its pathogenesis. Increased circulating levels of free testosterone are a common finding in hyperandrogenism.[13]

Primary Ovarian Pathophysiology

Usually, only one follicle fully matures and releases an egg due to the way follicle growth is regulated. At birth, the ovaries contain about 2–3 million primordial follicles, which is much lower than the 6–7 million present during mid-pregnancy. It is important to control how quickly these primordial follicles are used up because they form a reserve that supports future fertility.[14] Active and inactive follicles exist together in a balanced state. In PCOS, hormones such as anti-Müllerian hormone (AMH), follicle-stimulating hormone (FSH), and androgens are not balanced, which leads to the stopping of follicle development. When luteinizing hormone (LH) is high, theca cells produce androgens. However, low FSH levels prevent the

conversion of androgens into estradiol, so no dominant follicle is selected, resulting in long-term absence of ovulation.[15] This balance is closely controlled by anti-Müllerian hormone (AMH), which is produced by granulosa cells and stops primordial follicles from developing into primary follicles. In PCOS, small follicles increase in number and size but then stop growing, leading to the characteristic polycystic appearance. Some researchers suggest that follicles in PCOS ovaries are significantly different from those in normal ovaries.[16]

Insulin Resistance (IR)/Hyperinsulinemia

Women with PCOS often have insulin resistance and high insulin levels, even if they are not overweight or do not have high androgen levels. They also have a higher risk of developing type 2 diabetes and problems with glucose tolerance.[17] Importantly, women with PCOS show tissue-specific insulin resistance. The adrenal glands and ovaries remain sensitive to insulin, which promotes steroid hormone production. However, tissues like fat, skeletal muscle, and liver become less responsive to insulin's metabolic effects. As a result, some tissues develop insulin resistance while steroid-producing tissues still respond to insulin.[18] Other factors may also contribute to insulin resistance and high insulin levels, such as the increase in testosterone during puberty. The link between low androgen levels and insulin resistance has been studied because some rare autoimmune diseases affecting insulin receptors are associated with low androgen features.[19]

Neuroendocrine Alterations

In PCOS, the hormones LH and FSH, which control ovulation and egg development, are released in an abnormal way. These hormones are not needed to diagnose PCOS, but they are still affected. Since PCOS mainly causes high male hormones and problems with ovulation, changes in LH and FSH may play a role. Women with PCOS often have higher LH levels, lower FSH levels, a higher LH/FSH ratio, and faster or stronger LH pulses.[20,21]

Other Metabolic and Endocrine Factors of GnRH Secretion in PCOS

Recent studies suggest that AMH may have a previously unknown role in stimulating GnRH-secreting neurons. In female mice, giving AMH directly into the brain increases pulsatile LH secretion in a dose-dependent way. AMH receptors (AMHR2) are present on GnRH neurons and are further activated through GnRH-related mechanisms. In PCOS, abnormal AMH levels may contribute to excessive LH secretion. However, although AMH may play an important role in PCOS-related hormonal dysfunction, its effect on GnRH secretion has so far only been shown in healthy (control) animals, not in PCOS patients or models.[22] Increased

GnRH/LH secretion is mainly caused by high androgen levels and possibly other ovarian factors, but high insulin levels and insulin resistance may also contribute to these brain and hormone changes.[23]

Pharmacological interventions

Key aspects of treating PCOS include identifying and managing symptoms such as anovulation-related infertility, androgen-related effects, and irregular menstruation. Antiandrogens, including cyproterone acetate (CPA), flutamide, and spironolactone, act either by blocking androgen receptors or reducing androgen production. They are primarily used to treat hirsutism and other androgen-related symptoms. While these drugs differ slightly in action, all inhibit testosterone effects. Spironolactone may cause menstrual irregularities and can feminize a male fetus if pregnancy occurs, so it is typically prescribed along with oral contraceptive pills (OCPs).[24]

Clomiphene Citrate (CC)

Clomiphene citrate (CC) is usually the first treatment used for women with PCOS to help induce ovulation. It is commonly used because it is effective in treating anovulation. Women who are obese often require higher doses of CC, but this may increase the risk of multiple pregnancies. Treatment usually starts with 50 mg per day on day 2 or 3 of the menstrual cycle and can be increased up to 250 mg per day over five days. Although CC increases ovulation rates by 60%–85%, pregnancy rates improve only modestly to 30%–40%, and there is a 5%–7% risk of multiple pregnancies.[25]

Insulin Sensitizers

Metformin and other insulin-sensitizing drugs like thiazolidinediones (TZDs) have been shown to improve ovulation by reducing insulin resistance. Metformin use is linked to better ovulation, reduced testosterone levels in the blood, and more regular menstrual cycles. Metformin, a biguanide, works by decreasing glucose absorption in the intestines, increasing insulin sensitivity in body tissues, and reducing glucose production in the liver. Thiazolidinediones may cause fluid retention and weight gain, while metformin is often associated with weight loss.[26]

CONCLUSIONS

PCOS is a complex disorder that affects multiple body systems and usually begins during early puberty. As more factors related to its development are identified, growing evidence suggests that hyperandrogenism plays an important role in affecting different tissues. Factors such as obesity, inflammation, lack of physical activity, and epigenetic changes may worsen the condition, but their exact role is not fully understood. Since there is no specific cure for PCOS, treatment is usually based on managing symptoms using drugs such as oral contraceptives, oral antidiabetic agents, or antiandrogens. More research is still needed to fully understand its causes and develop targeted treatments.

REFERENCES

1. Deans R: Polycystic ovary syndrome in adolescence. Med Sci (Basel), 2019; 7: 101. 10.3390/medsci7100101
2. Elasam AN, Ahmed MA, Ahmed AB, Sharif ME, Abusham A, Hassan B, Adam I: The prevalence and phenotypic manifestations of polycystic ovary syndrome (PCOS) among infertile Sudanese women: a crosssectional study. BMC Womens Health, 2022; 22: 165. 10.1186/s12905-022-01762-6
3. Witchel, S.F.; E Oberfield, S.; Peña, A.S. Polycystic Ovary Syndrome: Pathophysiology, Presentation, and Treatment With Emphasis on Adolescent Girls. J. Endocr. Soc, 2019; 3: 1545–1573. [CrossRef] [PubMed]
4. Polycystic Ovary Syndrome. Available online: https://www.womenshealth.gov/a-z-topics/polycystic-ovary-syndrome (accessed on 22 September 2021)
5. Bednarska, S.; Siejka, A. The pathogenesis and treatment of polycystic ovary syndrome: What's new? Adv. Clin. Exp. Med, 2017; 26: 359–367. [CrossRef] [PubMed]
6. Damone, A.L.; Joham, A.E.; Loxton, D.; Earnest, A.; Teede, H.J.; Moran, L.J. Depression, anxiety and perceived stress in women with and without PCOS: A community-based study. Psychol. Med, 2019; 49: 1510–1520. [CrossRef]
7. Differential Diagnosis of PCOS. Available online: https://www.verywellhealth.com/what-is-the-differential-diagnosis-of-pcos2616642 (accessed on 6 December 2021)
8. Witchel, S.F.; Burghard, A.C.; Tao, R.H.; Oberfield, S.E. The diagnosis and treatment of PCOS in adolescents. Curr. Opin. Pediatr, 2019; 31: 562–569. [CrossRef]
9. Polycystic Ovary Syndrome (PCOS). Available online: https://www.mayoclinic.org/diseases-conditions/pcos/diagnosistreatment/drc-20353443 (accessed on 6 December 2021).

10. Rocha, A.L.; Oliveira, F.R.; Azevedo, R.C.; Silva, V.A.; Peres, T.M.; Candido, A.L.; Gomes, K.B.; Reis, F.M. Recent advances in the understanding and management of polycystic ovary syndrome. F1000Research, 2019; 8: 565. [CrossRef]
11. Stefanaki, C.; Pervanidou, P.; Boschiero, D.; Chrousos, G.P. Chronic stress and body composition disorders: Implications for health and disease. Hormones, 2018; 17: 33–43. [CrossRef]
12. Kumar, R.; Minerva, S.; Shah, R.; Bhat, A.; Verma, S.; Chander, G.; Bhat, G.R.; Thapa, N.; Bhat, A.; Wakhloo, A.; et al. Role of genetic, environmental, and hormonal factors in the progression of PCOS: A review. J. Reprod. Healthc. Med, 2022; 3: 3. [CrossRef]
13. Ibáñez L, Oberfield SE, Witchel S, et al.: An international consortium update: pathophysiology, diagnosis, and treatment of polycystic ovarian syndrome in adolescence. Horm Res Paediatr, 2017; 88: 371-95. 10.1159/000479371
14. Hsueh AJ, Kawamura K, Cheng Y, Fauser BC: Intraovarian control of early folliculogenesis. Endocr Rev, 2015; 36: 1-24. 10.1210/er.2014-1020
15. Gervásio CG, Bernuci MP, Silva-de-Sá MF, Rosa-E-Silva AC: The role of androgen hormones in early follicular development. ISRN Obstet Gynecol, 2014; 2014: 818010. 10.1155/2014/818010
16. Webber LJ, Stubbs S, Stark J, Trew GH, Margara R, Hardy K, Franks S: Formation and early development of follicles in the polycystic ovary. Lancet, 2003; 362: 1017-21. 10.1016/s0140-6736(03)14410-8
17. Diamanti-Kandarakis E, Dunaif A: Insulin resistance and the polycystic ovary syndrome revisited: an update on mechanisms and implications. Endocr Rev, 2012; 33: 981-1030. 10.1210/er.2011-1034
18. Geffner ME, Golde DW: Selective insulin action on skin, ovary, and heart in insulin-resistant states. Diabetes Care, 1988; 11: 500-5. 10.2337/diacare.11.6.500
19. Moller DE, Flier JS: Insulin resistance--mechanisms, syndromes, and implications. N Engl J Med, 1991; 325: 938-48. 10.1056/NEJM199109263251307
20. Azziz R: Polycystic ovary syndrome. Obstet Gynecol, 2018; 132: 321-36. 10.1097/AOG.0000000000002698
21. Taylor AE, McCourt B, Martin KA, Anderson EJ, Adams JM, Schoenfeld D, Hall JE: Determinants of abnormal gonadotropin secretion in clinically defined women with polycystic ovary syndrome. J Clin Endocrinol Metab, 1997; 82: 2248-56. 10.1210/jcem.82.7.4105

22. Cimino I, Casoni F, Liu X, et al.: Novel role for anti-Müllerian hormone in the regulation of GnRH neuron excitability and hormone secretion. Nat Commun, 2016; 7: 10055. 10.1038/ncomms10055
23. Chavez JA, Summers SA: A ceramide-centric view of insulin resistance. Cell Metab, 2012; 15: 585-94. 10.1016/j.cmet.2012.04.002
24. Badawy A, Elnashar A: Treatment options for polycystic ovary syndrome. Int J Womens Health, 2011; 3: 25- 35. 10.2147/IJWH.S11304
25. Kafy S, Tulandi T: New advances in ovulation induction. Curr Opin Obstet Gynecol, 2007; 19: 248-52. 10.1097/GCO.0b013e3280c60c9a
26. Seli E, Duleba AJ: Should patients with polycystic ovarian syndrome be treated with metformin?. Hum Reprod, 2002; 17: 2230-6. 10.1093/humrep/17.9.2230