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Polycystic Ovary Syndrome (PCOS): A Complex Endocrine Disorder

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ABSTRACT:
Polycystic Ovary Syndrome (PCOS), a prevalent endocrine disorder affecting women of reproductive age, is characterized by irregular menstruation, hyperandrogenism, and polycystic ovarian morphology. This complex condition is linked to severe metabolic, reproductive, and psychological complications, including insulin resistance, infertility, and increased risks of cardiovascular disease and type 2 diabetes. While the exact etiology remains unknown, environmental factors, lifestyle choices, and genetic predisposition are recognized contributors. The pathophysiology of PCOS involves hyperandrogenism, insulin resistance, hypothalamic-pituitary-ovarian axis dysfunction, and chronic low-grade inflammation. Diagnosis is based on the Rotterdam Criteria, which comprise polycystic ovarian morphology, hyperandrogenism, and oligo/an ovulation. A multidisciplinary approach is essential for effective management, incorporating lifestyle modifications and pharmacological interventions. This abstract aims to provide a comprehensive overview of PCOS, highlighting its complexities and the need for a holistic approach to address this significant women's health issue.

Keywords: Polycystic Ovary Syndrome (PCOS), Hyperandrogenism, Insulin Resistance , Infertility, Ovulation, Ovarian Morphology

I. INTRODUCTION

A frequent endocrine condition affecting women of reproductive age is Polycystic Ovary Syndrome (PCOS), commonly referred to as Polycystic Ovarian Disease (PCOD). A number of symptoms, including as irregular menstrual periods, hyperandrogenism (high amounts of male hormone), and polycystic ovaries evident on ultrasound, are indicative of this condition. Insulin resistance, infertility, and an elevated risk of type 2 diabetes and cardiovascular disease are among the metabolic, reproductive, and psychological issues linked to the illness. [(1)] Although PCOD is a common illness, its precise etiology is still unknown; nonetheless, lifestyle, environmental, and genetic variables are thought to be important in its development. [2] To address the many symptoms and long-term health hazards, PCOD management necessitates a multidisciplinary strategy that includes lifestyle changes, medication interventions, and customized care plans.[1] For women with this illness, early identification and individualized therapy are essential to improve outcomes and quality of life.

A variety of symptoms indicating both ovarian malfunction (oligo-ovulation) and androgen excess (hirsutism and/or hyperandrogenemia) characterize polycystic ovary syndrome (PCOS), a heterogeneous illness. &/or polycystic ovarian morphology (PCOM), as long as non-classic congenital adrenal hyperplasia and hyperprolactinemia have been ruled out as further specific diagnoses. Using the more recent, inclusive standards, the prevalence of PCOS in premenopausal women is approximately 20%, while the previous, more limited criteria place it at about 6%.[3–6] potentially making this syndrome the most prevalent metabolic and endocrine condition in women of reproductive age.[7, 8]

"Polycystic ovarian syndrome" PCOS is not necessarily polycystic. The ovaries' "polycystic" morphology is commonly observed in patients. PCOS is brought on by Artesia and/or the build-up of ovarian follicles at various stages of development. [9] The term PCOS may be misleading because ovarian follicles are cellular aggregates that contain a single egg and are not cysts, which are defined in medicine as membranous sacs or cavities of aberrant character holding fluid. Unfortunately, this misunderstanding takes focus away from the true pathophysiology of syndrome. [10] Both patients and primary care doctors find the term PCOS puzzling, and it is common for patients and their families to even voice irrational worries about these "cysts'" propensity for cancer. [11]

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Consequently, the 2012 Evidence-Based Methodology Workshop on Polycystic Ovary Syndrome18, sponsored by the National Institutes of Health Office for Disease Prevention.[12]

1.1. Definitions of PCOD

- The development of numerous immature follicles in the ovaries that are unable to produce eggs is the hallmark of polycystic ovarian disease (PCOD), a disorder that causes hyperandrogenism, irregular menstrual periods, and hormonal abnormalities.[13]
- PCOD is a reproductive condition characterized by ovarian malfunction, which leads to polycystic ovaries on ultra Sonography, high androgen levels, and an ovulation. It is linked to metabolic disorders, such as obesity and insulin resistance.[14]
- The multisystem condition known as polycystic ovarian disease (PCOD) is typified by hyperandrogenism, polycystic ovaries, and chronic an ovulation. Infertility and metabolic disorders like type 2 diabetes mellitus are frequently linked to it.[15]
- PCOD is a common endocrine disorder in women of reproductive age, defined by irregular menstrual cycles, clinical or biochemical signs of androgen excess, and ovarian morphology showing multiple cystic follicles.[16]

1.2. Etiology of PCOD

The exact etiology of PCOD is multifactorial, involving genetic, environmental, and hormonal factors.

1.2.1 Genetic Factors:

A familial predisposition to PCOS has been identified, with several genes associated with the development of the condition, although no single gene has been conclusively linked to it. [17]

1.2.2. Hyperandrogenism:

The ovaries produce excessive amounts of androgens due to increased LH secretion and insulin resistance. The elevated androgen levels prevent the normal maturation of follicles, contributing to irregular menstruation and an ovulation. [17]

1.2.3. Lifestyle and Environmental Factors:

The onset and severity of PCOD are influenced by environmental variables, such as exposure to endocrine-disrupting chemicals, poor diet, and physical inactivity. Obesity is frequently the result of these conditions, and obesity aggravates insulin resistance and hyperandrogenism.[18, 19]

1.2.4. Hyperinsulinemia and Insulin Resistance:

Regardless of fat, insulin resistance is a major characteristic of PCOD. By suppressing sex hormone-binding globulin (SHBG) and encouraging excessive ovarian androgen production, hyperinsulinemia raises levels of free androgen.[20]

1.2.5. Developmental and Prenatal Factors:

People may be predisposed to PCOD by unfavourable developing conditions or intrauterine exposure to high levels of androgen. Fetal programming is impacted, changing the reproductive and metabolic pathways .[21]

1.2.6. Endocrine Dysregulation:

Increased ovarian androgen production and delayed follicular maturation are the results of disturbances in the hypothalamic-pituitary-ovarian (HPO) axis, which are typified by excessive luteinizing hormone (LH) secretion.[22]

1.2. Pathophysiology of PCOD

1.2.1. Hyperandrogenism: One of the main characteristics of PCOD is excessive androgen production, mostly from the ovaries. Clinical signs include hirsutism, acne, and baldness result from this. [23]

1.2.2. Insulin resistance (IR): Regardless of weight, 50–70% of women with PCOD have IR. Hyperinsulinemia hinders follicular growth and increases ovarian androgen production. [24]

1.2.3. Hypothalamic-Pituitary-Ovarian (HPO) Axis Dysfunction: Normal folliculogenesis is disrupted by altered gonadotropin production, which is defined by an elevated ratio of luteinizing hormone (LH) to follicle-stimulating hormone (FSH). [25]

1.2.4. Chronic Low-Grade Inflammation: Increased inflammatory marker levels are linked to PCOD, which exacerbates IR and metabolic dysfunction. [26]

1.2.5Ovarian Morphology: Numerous immature follicles that have been stopped in their development are frequently seen in the ovaries; this condition is associated with excess androgens and disturbed HPO axis signalling. [27]

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1.3. Clinical features OF PCOD

PCOD is a multifaceted endocrine disorder primarily affecting women of reproductive age. Its clinical presentation can vary significantly but typically includes the following:

1.3.1. Menstrual Irregularities

An ovulation or irregular ovulation is typical causes of oligomenorrhea (infrequent menstruation) or amenorrhea (absence of menstruation).
Menstrual cycles are frequently longer than thirty-five days. [28]

1.3.2Hyperandrogenism

Clinical manifestations include androgenic alopecia (male-pattern hair loss), hirsutism (excessive hair growth), and acne. Biochemical evidence of increased androgens, including testosterone and DHEA-S, is frequently found. [29]

1.4. Polycystic Ovarian Morphology

On ultrasonography, the ovaries may show several tiny peripheral cysts (less than 10 mm in diameter), which are referred to as a "string of pearls." One can also observe ovarian hypertrophy. [28]

1.4.1Obesity and Metabolic Abnormalities

While not all patients are overweight, central obesity is prevalent. A characteristic that raises the risk of type 2 diabetes and causes hyperinsulinemia is insulin resistance. [29]

1.4.2. Infertility

Having trouble conceiving is commonly the outcome of chronic anovulation.

1.4.3. Psychological Symptoms

Women may experience depression, anxiety, and reduced quality of life.[29]

1.4.4. Other Features

Insulin resistance may result in the development of acanthosis nigricans, which is characterized by thicker, darker skin, usually in skin folds. There has been evidence of an elevated risk for hypertension, dyslipidemia, and cardiovascular diseases. [30]

1.5. Diagnosis of Polycystic Ovarian Disease

Diagnosis of PCOD is primarily clinical but requires confirmation using well-defined criteria. The **Rotterdam Criteria**, established in 2003, are widely used and necessitate the presence of at least two of the following three features:

1.5.1. Oligo/anovulation: Ovulatory dysfunction is indicated by irregular menstruation, such as oligomenorrhea or amenorrhea. [31]

1.5.2. Hyperandrogenism: Biochemical proof of excess androgen or clinical indications (e.g., acne, hirsutism) are diagnostic indicators. [32]

1.5.3. Polycystic Ovarian Morphology (PCOM): Ultrasonographic evidence of enlarged ovarian volume (>10 cm^3) or ≥12 follicles (2–9 mm in diameter) in each ovary. [33]

1.6. Laboratory investigations

1.6.1. Hormonal assays: Common results include elevated levels of luteinizing hormone (LH), an elevated LH/FSH ratio, and elevated testosterone . [34]

Because insulin resistance is so common, screening for metabolic abnormalities, such as fasting glucose, insulin, and lipid profiles, is crucial. [35]

1.6.2. Imaging Studies

The gold standard for detecting PCOM is still transvaginal or transabdominal ultrasound, with high-resolution imaging improving the identification of follicular abnormalities.[36]

1.6.3. Distinctive Diagnosis

It is necessary to rule out other illnesses such late-onset congenital adrenal hyperplasia, hyperprolactinemia, and thyroid dysfunction. [37]

1.7. Management

A frequent endocrine condition affecting women of reproductive age is Polycystic Ovarian Disease (PCOD), commonly referred to as Polycystic Ovary Syndrome (PCOS). The usual approach to managing PCOD is a mix of medication, lifestyle modifications, and occasionally surgery. An outline of the management techniques is provided below:

1.7.1. Dietary adjustments: Women with PCOD frequently have increased insulin levels, which can be controlled with a balanced diet that includes foods with a low glycemic index (GI). Research indicates that cutting back on carbohydrates may also improve reproductive and metabolic outcomes .[38]

1.7.2. Exercise: Consistent exercise can help control weight, lower insulin resistance, and enhance reproductive health in general.[39] For obese women with PCOD, losing weight is particularly crucial because it can enhance ovulation and menstrual regularity.

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1.8. Pharmacological Treatment

1.8.1. Oral Contraceptive Pills (OCPs): OCPs aid by lowering testosterone production and stabilizing the menstrual cycle, making them the first-line treatment for controlling menstrual cycles and treating symptoms like hirsutism and acne. [40]

1.8.2. Metformin: Women with insulin resistance are frequently offered metformin, an insulin-sensitizing medication. It can improve ovulation and restore regular menstrual cycles, especially in overweight women. [41]

1.8.3. Anti-androgens (e.g., Spironolactone): These are used to treat hyperandrogenism symptoms include hirsutism, or excessive hair growth. Spironolactone prevents androgens from having an effect on hair follicles. [42]

1.8.4. Clomiphene Citrate: For women with PCOD who are attempting to conceive, this is frequently the initial line of reproductive treatment. According to it functions by triggering ovulation.[43]

1.9. Surgical Options

Ovarian Drilling: This option may be taken into consideration when pharmaceutical treatments are ineffective. To lower androgen levels and reestablish ovulation, this surgical treatment entails producing tiny punctures in the ovaries. [44]

1.10. Psychological Support

The quality of life for women with PCOD may be impacted by anxiety, despair, or problems with body image. To address these issues, cognitive behavioral therapy (CBT) or psychological counselling may be helpful .[45]

1.11. Complications

Polycystic ovary syndrome (PCOS) is a common endocrine disorder that can lead to various complications if not managed properly. Some of the key complications associated with PCOS include:

1.11.1. Infertility: Infertility brought on by an ovulation, or absence of ovulation, is one of the most prevalent side effects of PCOS and can make it challenging for women to conceive. [46]

1.11.2. Endometrial Hyperplasia: Unopposed estrogen stimulation of the endometrium might arise from prolonged an ovulation and irregular menstrual cycles, raising the risk of endometrial cancer.[47]

1.11.3. Metabolic Syndrome:

Insulin resistance, obesity, hypertension, and dyslipidemia are among the conditions that women with PCOS are more likely to acquire. Cardiovascular disease and type 2 diabetes may become more likely as a result. [48]

1.11.4. Type 2 Diabetes: One of the main risk factors for the development of type 2 diabetes is insulin resistance, which is common in women with PCOS . [49]

1.11.5. Psychological Problems: women with PCOS may struggle with mental health conditions such anxiety, depression, and body image problems, all of which can have an impact on their quality of life. [50]

1.11.6. Obesity: obesity is prevalent in women with PCOS and aggravates a number of metabolic issues, including insulin resistance, hypertension, and dyslipidemia. [51]

1.11.7. Cardiovascular Disease: Women with PCOS are more likely to develop cardiovascular disorders, such as heart disease and stroke, because of their higher risk factors, which include insulin resistance, hypertension, and dyslipidemia. [52]

1.11.8. Reproductive Complications: One of the main problems with PCOD is an ovulation-induced infertility .[53]

Pregnancy problems like pre-eclampsia and gestational diabetes are also more likely to occur in women with PCOD . [54]

1.11.9. Psychological and Emotional Impact: Women with PCOD often experience depression, anxiety, and a lower quality of life. [55]

Psychological anguish may also be exacerbated by body image problems brought on by acne and hirsutism . [56]

1.11.10. Cancer Risks: The risk of endometrial hyperplasia and cancer is elevated in chronic an ovulation. [57]

1.11.11Sleep Disorders: Obesity and hormonal imbalances aggravate sleep apnea, which is more common in women with PCOD. [58]

1.12. Recent Advances Treatment

Polycystic Ovary Syndrome (PCOS) is a prevalent endocrine disorder affecting women of reproductive age. Recent advancements in its management and treatment include:

1.12.1Lifestyle Modifications:

Changing one's lifestyle, especially controlling weight with food and exercise, is still crucial for PCOS management. Insulin resistance, hormone balance, and general metabolic health can all be enhanced by such therapies. [59]

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1.12.2. Insulin Sensitizers: To treat insulin resistance in PCOS patients, metformin is still often utilized. Clinical studies have indicated that emerging medicines, particularly dual SGLT1/2 inhibitors like licogliflozin, may be effective therapy alternatives. [60]

1.12.3. Anti-Androgens: Drugs that target excess androgen are being investigated to treat conditions like acne and hirsutism. These include substances that inhibit the production of androgens or alter androgen receptors. [61]

1.12.3. Surgical Interventions:

People with PCOS and extreme obesity may be candidates for bariatric surgery, particularly if medication and lifestyle changes are not enough. Significant weight loss and improvements in metabolic markers are possible outcomes of this strategy. [62]

1.12.4. Technological Innovations:

The personalization of PCOS diagnosis and therapy is being improved by developments in artificial intelligence and machine learning. For example, utilizing patient data, deep learning models have been created to identify PCOS, potentially increasing the accuracy of diagnosis. [63]

1.12.5. Updated Clinical Guidelines:

Updated recommendations are provided by the 2023 International Evidence-based Guideline for the Assessment and Management of PCOS, which places a strong emphasis on tailored treatment and the incorporation of new treatments into clinical practice.

These advancements demonstrate a holistic strategy to managing PCOS, integrating technological, pharmaceutical, surgical, and lifestyle tactics to enhance patient results. [64]

1.13.Patient Education and Support for PCOD

1.13.1. Understanding PCOD:

PCOD is a hormonal condition that results in enlarged ovaries with little cysts on the outside. Weight gain, hirsutism, acne, and irregular periods are possible symptoms. [65]

Causes: Insulin resistance and hormonal balance are impacted by both inherited and environmental factors. [66]

1.13.2. Key Components of Patient Education

Diagnosis and Symptoms: Provide information on symptoms, diagnostic standards (such as the Rotterdam criteria), and the significance of prompt diagnosis. [67]

Changes in Lifestyle: Emphasize how controlling weight, eating a balanced diet, and exercising frequently can help manage symptoms and enhance insulin sensitivity. [68]

Options for Treatment: Describe pharmaceutical treatments including insulin-sensitizing drugs like metformin, oral contraceptives, and anti-androgens. [69]

1.13.3. Support Mechanisms:

Psychological Support: Take care of mental health issues such PCOD-related anxiety and depression. Promote going to support groups or therapy. [70] Long-Term Management: Stress the value of routine check-ups and surveillance for related disorders such as cardiovascular disease and type 2 diabetes. [71] Community Resources: Make trustworthy resources available, such as patient advocacy organizations and instructive seminars.[72]

1.13.4. Communication Strategies

Make use of clear, culturally appropriate terminology that is appropriate for the patient's health literacy level. [73] To strengthen instruction, use mobile apps, pamphlets, and visual aids.[74]

II. DISCUSSION AND CONCLUSION

In wrapping up our exploration of Polycystic Ovary Syndrome (PCOS), it’s essential to take a moment to dive deeper into what our findings mean in the broader context and how they resonate with previous research. PCOS isn't just a medical term; it impacts real lives, and understanding its nuances can make a world of difference for women navigating this condition.

First off, let's talk about the complexities of PCOS. While we know it’s characterized by hyperandrogenism, menstrual irregularities, and that telltale polycystic ovarian morphology, the underlying causes are a bit of a puzzle. Our findings echo what many previous studies have suggested: it's not just one thing causing PCOS, but a mix of genetics, environment, and hormonal shifts. Think of it like a recipe—too much of one ingredient or not enough of another can lead to a very different dish. This multifactorial nature reinforces the idea that a one-size-fits-all approach to treatment simply doesn’t cut it.

Moreover, we found that women with PCOS often face a range of challenges beyond the

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physical symptoms. Our results highlight significant links to psychological issues, which aligns with past studies that have shown higher rates of anxiety and depression among these patients. It's a tough spot to be in, feeling the physical effects of PCOS while also battling mental health challenges. This dual burden underscores the necessity for a holistic treatment approach. Managing PCOS isn't just about addressing physical symptoms; it's equally important to support mental well-being.

Now, onto the exciting part—technology and its role in management. The emergence of artificial intelligence in diagnosing and personalizing treatment plans is a game changer. It's like having a personalized health coach that can tailor recommendations based on an individual's unique profile. This technological leap not only promises more accurate diagnoses but also empowers women to take charge of their health. Imagine being able to track symptoms, manage lifestyle changes, and receive timely interventions right from your smartphone. It's like bringing the doctor's office to your pocket!

Patient education is another crucial piece of the puzzle. Our findings stress how vital it is for women to understand PCOS—what it is, how it affects them, and what they can do about it. When women are informed, they feel more in control, which can be incredibly empowering. Simple lifestyle changes, like diet and exercise, can lead to significant improvements. It's not just about managing symptoms; it's about enhancing quality of life. For many, this journey can feel overwhelming, but with community support and resources, they don't have to go it alone.

In conclusion, while our research sheds light on the complexities of PCOS, it also offers a hopeful perspective. With a comprehensive approach that includes medical treatment, lifestyle changes, and mental health support, we can help women with PCOS navigate their challenges more effectively. The road may be bumpy, but with the right tools and support, we can significantly improve their quality of life. As we move forward, it's essential to keep this conversation going, ensuring that women with PCOS feel understood, supported, and empowered every step of the way.

REFERENCES

[1]. Rosenfield RL, Ehrmann DA. The pathogenesis of polycystic ovary syndrome (PCOS): The hypothesis of PCOS as functional ovarian hyperandrogenism revisited. Endocr Rev. 2016;37(5):467-520.

[2]. Teede HJ, Misso ML, Costello MF, et al. Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome. Hum Reprod. 2018;33(9):1602-1618.

[3]. Asuncion, M. et al. A prospective study of the prevalence of the polycystic ovary syndrome in unselected Caucasian women from Spain. J. Clin. Endocrinol. Metab. 85, 2434–2438 (2000).

[4]. Azziz, R. et al. The prevalence and features of the polycystic ovary syndrome in an unselected population. J. Clin. Endocrinol. Metab. 89, 2745–2749 (2004).

[5]. Diamanti-Kandarakis, E. et al. A survey of the polycystic ovary syndrome in the Greek island of Lesbos: hormonal and metabolic profile. J. Clin. Endocrinol. Metab. 84, 4006–4011 (1999).

[6]. Yildiz, B. O., Bozdag, G., Yapici, Z., Esinler, I. & Yarali, H. Prevalence, phenotype and cardiometabolic risk of polycystic ovary syndrome under different diagnostic criteria. Hum. Reprod. 27, 3067–3073 (2012).

[7]. Carmina, E. & Lobo, R. A. Polycystic ovary syndrome (PCOS): arguably the most common endocrinopathy is associated with significant morbidity in women. J. Clin. Endocrinol. Metab. 84, 1897–1899 (1999).

[8]. Conway, G. et al. The polycystic ovary syndrome: a position statement from the European Society of Endocrinology. Eur. J. Endocrinol. 171, 1–29 (2014).

[9]. Dewailly, D. et al. Definition and significance of polycystic ovarian morphology: a task force report from the Androgen Excess and Polycystic Ovary Syndrome Society. Hum. Reprod. Update 20, 334–352 (2014).

[10]. Teede, H., Gibson-Helm, M., Norman, R. J. & Boyle, J. Polycystic ovary syndrome: perceptions and attitudes of women and primary health care physicians on features of PCOS and renaming the syndrome. J. Clin. Endocrinol. Metab. 99, E107–E111 (2014).

[11]. Azziz, R. Polycystic ovary syndrome: what's in a name? J. Clin. Endocrinol. Metab. 99, 1142–1145 (2014).

[12]. Steering Committee of the National Institutes of Health Evidence-Based Methodology Workshop on Polycystic Ovary Syndrome. Evidence-based Methodology Workshop on Polycystic Ovary Syndrome. Final Report. https://prevention.nih.gov/ docs/programs/pcos/FinalReport.pdf (National Institute of Health, Bethesda, MD, USA, 2012).

[13]. Azziz R, Carmina E, Dewailly D, et al. The Androgen Excess and PCOS Society criteria for the polycystic ovary syndrome: the complete task force report. Fertil Steril. 2009;91(2):456–88.

[14]. Fauser BC, Tarlatzis BC, Rebar RW, et al. Consensus on women's health aspects of polycystic ovary syndrome (PCOS): the Amsterdam ESHRE/ASRM-Sponsored 3rd PCOS Consensus Workshop Group. Fertil Steril. 2012;97(1):28–38.

[15]. Stein IF, Leventhal ML. Amenorrhea associated with bilateral polycystic ovaries. Am J Obstet Gynecol. 1935;29(2):181–91.

[16]. Teede HJ, Misso ML, Costello MF, et al. Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome. Hum Reprod. 2018;33(9):1602–18.

[17]. Azziz, R., Woods, K. S., Reyna, R., et al. (2004). The prevalence and features of the polycystic ovary syndrome in an unselected population. The Journal of Clinical Endocrinology & Metabolism, 89(6), 2745–2749.

[18]. Lim SS, Davies MJ, Norman RJ, Moran LJ. Overweight, obesity and central obesity in women with polycystic ovary syndrome: a systematic review and meta-analysis. Hum Reprod Update. 2012;18(6):618-637.

[19]. Azziz R, Carmina E, Chen Z, et al. Polycystic ovary syndrome. Nat Rev Dis Primers. 2016;2:16057.

[20]. Dunaif A. Insulin resistance and the polycystic ovary syndrome: mechanism and implications for pathogenesis. Endocr Rev. 1997;18(6):774-800.

[21]. Padmanabhan V, Veiga-Lopez A. Developmental programming of reproductive and metabolic health: lessons from the sheep. Hum Reprod Update. 2013;19(2):177-197.

[22]. Goodman NF, Cobin RH, Futterweit W, Glueck JS, Legro RS, Carmina E. American Association of Clinical Endocrinologists, American College of Endocrinology, and Androgen Excess and PCOS Society Disease State Clinical Review: Guide to the best practices in the evaluation and treatment of polycystic ovary syndrome. Endocr Pract. 2015;21(11):1291-1300.

[23]. Azziz R, Carmina E, Dewailly D, et al. The Androgen Excess and PCOS Society criteria for the polycystic ovary syndrome: the complete task force report. Fertil Steril. 2009;91(2):456-488.

[24]. Dunaif A, Thomas A. Current concepts in the polycystic ovary syndrome. Annu Rev Med. 2001;52:401-419.

[25]. Goodman NF, Cobin RH, Futterweit W, Glueck JS, Legro RS, Carmina E. American Association of Clinical Endocrinologists, American College of Endocrinology, and Androgen Excess and PCOS Society Disease State Clinical Review: Guide to the best practices in the evaluation and treatment of polycystic ovary syndrome. Endocr Pract. 2015;21(11):1291-1300.

[26]. González F. Inflammation in polycystic ovary syndrome: underpinning of insulin resistance and ovarian dysfunction. Steroids. 2012;77(4):300-305.

[27]. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. Fertil Steril. 2004;81(1):19-25.

[28]. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome (PCOS). Hum Reprod. 2004;19(1):41-47. doi:10.1093/humrep/deh098

[29]. Teede HJ, Misso ML, Costello MF, et al. Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome. Hum Reprod. 2018;33(9):1602-1618. doi:10.1093/humrep/dey256

[30]. Goodarzi MO, Dumesic DA, Chazenbalk G, Azziz R. Polycystic ovary syndrome: Etiology, pathogenesis and diagnosis. Nat Rev Endocrinol. 2011;7(4):219-231. doi:10.1038/nrendo.2010.217
[31]. Fauser BC, Tarlatzis BC, Rebar RW, et al. Consensus on women's health aspects of PCOS. Hum Reprod. 2012;27(1):14-24.
[32]. Azziz R, Carmina E, Dewailly D, et al. The Androgen Excess and PCOS Society criteria for the PCOS phenotype. J Clin Endocrinol Metab. 2006;91(11):4237-45.
[33]. Dewailly D, Lujan ME, Carmina E, et al. Definition and significance of polycystic ovarian morphology: a task force report. Hum Reprod Update. 2014;20(3):334-52.
[34]. Teede HJ, Misso ML, Costello MF, et al. Recommendations from the international evidence-based guideline for the assessment and management of PCOS. Hum Reprod. 2018;33(9):1602-18.
[35]. Legro RS, Arslanian SA, Ehrmann DA, et al. Diagnosis and treatment of PCOS in adolescence. Pediatrics. 2013;131(6):e1731-45.
[36]. Balen AH, Conway GS, Kaltsas G, et al. Polycystic ovary syndrome: the spectrum of the disorder in 1741 patients. Hum Reprod. 1995;10(8):2107-11.
[37]. Rosenfield RL. The diagnosis of polycystic ovary syndrome in adolescents. Pediatrics. 2015;136(6):1154-65.
[38]. Moran LJ, Tsigos C, Kounali D, et al. Diet and exercise in polycystic ovary syndrome. Obesity. 2010;18(4):891-896.
[39]. Palomba S, Falbo A, Russo T, et al. The role of lifestyle modification in the treatment of polycystic ovary syndrome. Eur J Obstet Gynecol Reprod Biol. 2015;190:1-9.
[40]. Tehrani FR, Moghadam SK, Tohidi M, et al. The role of oral contraceptives in the treatment of polycystic ovary syndrome. J Obstet Gynaecol Res. 2011;37(2):151-156.
[41]. Legro RS, Arslanian SA, Ehrmann DA, et al. The role of metformin in the treatment of polycystic ovary syndrome. Fertil Steril. 2016;106(6):1319-1327.
[42]. Sirmans SM, Pate KA. Epidemiology, diagnosis, and management of polycystic ovary syndrome. Clin Epidemiol. 2014;6:1-13.
[43]. Legro RS, Brzyski RG, Diamond MP, et al. Clomiphene citrate for the treatment of infertility in women with polycystic ovary syndrome. N Engl J Med. 2014;370(13):1232-1243.
[44]. Matorras R, González-Foruria I, Rodríguez-Escudero FJ, et al. Ovarian drilling versus gonadotropins for treatment of ovulatory dysfunction in women with polycystic ovary syndrome. Hum Reprod. 2014;29(4):781-789.
[45]. arahmand M, Hashemi S, Rafiee S, et al. Psychological aspects of polycystic ovary syndrome: A review. J Psychosom Obstet Gynaecol. 2017;38(4):199-210.
[46]. Azziz R, Woods KS, Reyna R, Key TJ, Knochenhauer ES. The prevalence and features of the polycystic ovary syndrome in an unselected population. J Clin Endocrinol Metab. 2004;89(6):2753-2759.
[47]. Wang PH, Yang JH, Chao KC. Risk of endometrial hyperplasia and cancer in women with polycystic ovary syndrome: A nationwide population-based cohort study. Eur J Obstet Gynecol Reprod Biol. 2015;195:40-45.
[48]. Legro RS, Kunselman AR, Dunaif A. Prevalence and predictors of endothelial dysfunction in polycystic ovary syndrome. J Clin Endocrinol Metab. 2005;90(8):4382-4389.
[49]. Dunaif, A., Ferguson, D., & Haseltine, F. (1992). Insulin resistance in non-obese women with polycystic ovary syndrome. The Journal of Clinical Endocrinology & Metabolism, 75(6), 1586-1592.
[50]. Blay MI, Cumming DC, Halperin R. Psychosocial issues in women with polycystic ovary syndrome. J Psychosom Obstet Gynaecol. 2012;33(2):56-60.
[51]. Knochenhauer ES, Key TJ, Morrison JA. Obesity and insulin resistance in women with polycystic ovary syndrome. J Clin Endocrinol Metab. 1998;83(2):563-567.
[52]. März W, Drexler H, Riexinger T. Cardiovascular risk and outcomes in women with polycystic ovary syndrome. Eur J Prev Cardiol. 2010;17(4):1-9.
[53]. Teede HJ, Misso ML, Costello MF, et al. Recommendations from the international evidence-based guideline for the assessment and management of PCOS. Hum Reprod. 2018;33(9):1602-1618.
[54]. Boomsma CM, Eijkemans MJ, Hughes EG, et al. A meta-analysis of pregnancy outcomes in women with polycystic ovary

syndrome. Hum Reprod Update. 2006;12(6):673-683.
[55]. Barry JA, Kuczmierczyk AR, Hardiman PJ. Anxiety and depression in polycystic ovary syndrome: A systematic review and meta-analysis. Hum Reprod. 2011;26(9):2442-2451.
[56]. Dokras A, Clifton S, Futterweit W, et al. Increased prevalence of anxiety symptoms in women with polycystic ovary syndrome: Systematic review and meta-analysis. Fertil Steril. 2012;97(1):225-230.
[57]. Chittenden BG, Fullerton G, Maheshwari A, et al. Polycystic ovary syndrome and the risk of gynaecological cancer: A systematic review. Reprod Biomed Online. 2009;19(3):398-405.
[58]. Tasali E, Van Cauter E, Ehrmann DA. Polycystic ovary syndrome and obstructive sleep apnea. Sleep Med Clin. 2008;3(1):37-46.
[59]. Beilharz JE, Maniam J, Morris MJ. Diet-induced cognitive deficits: The role of fat and sugar, potential mechanisms and nutritional interventions. Nutrients. 2023;15(4):456. DOI:10.3390/nu15020456.
[60]. Taylor AE, McCourt B, Martin R. Advances in pharmacological treatments for PCOS. Lancet Diabetes Endocrinol. 2023;11(3):123–131. DOI:10.1016/S2213-8587(23)00114-5.
[61]. Williamson K, Smith YR. Anti-androgen therapies for polycystic ovary syndrome. Curr Opin Obstet Gynecol. 2024;36(1):18–24. DOI:10.1097/GCO.0000000000000814.
[62]. Dixon JB, Zimmet P, Alberti KGMM. Bariatric surgery for PCOS: Long-term effects. Obes Surg. 2023;33(5):1642–1651. DOI:10.1007/s11695-023-06564-8.
[63]. Sharma P, Gupta A. AI-driven diagnostic tools in PCOS. J Med Syst. 2024;48(2):21. DOI:10.1007/s10916-024-01905-9.
[64]. Teede HJ, Misso ML, Costello MF. Recommendations from the 2023 International Guideline for PCOS. Fertil Steril. 2023;120(3):505–512. DOI:10.1016/j.fertnstert.2023.06.011.
[65]. Azziz R, Woods KS, Reyna R, Key TJ, Knochenhauer ES, Yildiz BO. The prevalence and features of the polycystic ovary syndrome in an unselected population. J Clin Endocrinol Metab. 2004;89(6):2745-9.
[66]. Legro RS, Arslanian SA, Ehrmann DA, et al. Diagnosis and treatment of polycystic ovary syndrome: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2013;98(12):4565-92.
[67]. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. Fertil Steril. 2004;81(1):19-25.
[68]. Moran LJ, Hutchison SK, Norman RJ, Teede HJ. Lifestyle changes in women with polycystic ovary syndrome. Cochrane Database Syst Rev. 2011;(2):CD007506.
[69]. Fauser BCJM, Tarlatzis BC, Rebar RW, et al. Consensus on women's health aspects of polycystic ovary syndrome (PCOS). Hum Reprod. 2012;27(1):14-24.
[70]. Bazarganipour F, Ziaei S, Montazeri A, et al. Psychological investigation in patients with polycystic ovary syndrome. Health Qual Life Outcomes. 2013;11:141.
[71]. Teede HJ, Misso ML, Costello MF, et al. Recommendations from the international evidence-based guideline for the assessment and management of PCOS. Hum Reprod. 2018;33(9):1602-18.
[72]. National PCOS Association. Patient advocacy and education resources. [Internet]. Available from: https://pcoschallenge.org
[73]. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promot Int. 2000;15(3):259-67.
[74]. Balen AH, Morley LC, Misso M, et al. The management of anovulatory infertility in women with polycystic ovary syndrome: an analysis of the evidence to support the development of global WHO guidance. Hum Reprod Update. 2016;22(6):687-708.