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Green Tea as a Supportive Therapy for PCOS: Evaluating Its Impact on Symptom Relief

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ABSTRACT

Introduction: This review aims to examine the potential role of green tea in supporting the treatment of polycystic ovary syndrome (PCOS), with a focus on its impact on metabolic, hormonal and clinical symptoms associated with the condition.

Materials and Methods: A comprehensive review of the literature was conducted using the PubMed and Google Scholar databases using the following keywords: "Polycystic Ovary Syndrome", "green tea", "epigallocatechin gallate (EGCG)", "insulin resistance", "hyperandrogenism", "fertility".

Summary: Polycystic ovary syndrome (PCOS) is a common endocrine disorder characterized by hormonal imbalances, insulin resistance, and metabolic issues, leading to symptoms like irregular menstruation, hyperandrogenism, and infertility. Natural compounds, especially green tea rich in catechins like EGCG, have shown promising effects in improving insulin sensitivity, reducing androgen levels, aiding weight management, and enhancing fertility in PCOS. While preliminary studies are encouraging, further clinical research is needed to confirm the efficacy and safety of green tea and other natural therapies as complementary treatments for PCOS.

Conclusions: Green tea, particularly its main catechin EGCG, shows promise in alleviating PCOS symptoms through its antioxidant, anti-inflammatory and insulin-sensitizing effects. It may help improve insulin resistance, reduce androgen levels, and support ovarian function. However, more high-quality clinical studies are needed to confirm its therapeutic potential in PCOS management.

Keywords: "Polycystic Ovary Syndrome", "PCOS", "green tea", "epigallocatechin gallate (EGCG)", "insulin resistance", "hyperandrogenism", "catechins"

Introduction

Polycystic ovary syndrome (PCOS) represents the most prevalent endocrine pathology among women of reproductive age globally [1]. Depending on the diagnostic criteria applied, polycystic ovary syndrome (PCOS) impacts approximately 8% to 20% of women of reproductive age worldwide each year [2]. PCOS is widely recognized as a complex and multifaceted endocrine disorder that is primarily characterized by elevated levels of circulating androgens, disturbances in ovulatory function, often manifesting as irregular or absent menstrual cycles and anovulation and the presence of polycystic ovarian morphology, identifiable through ultrasound as an increased number of small, immature follicles arranged

peripherally around an enlarged ovary [3]. Patients diagnosed with PCOS often present with menstrual irregularities, including oligomenorrhea, secondary amenorrhea, or dysfunctional uterine bleeding. It is estimated that approximately 85% to 90% of women exhibiting oligomenorrhea and 30% to 40% of those with amenorrhea are diagnosed with PCOS. Frequent clinical manifestations of hyperandrogenism PCOS commonly include hirsutism, characterized by excessive coarse hair growth in a male-pattern distribution, androgenic alopecia and persistent acne, often resistant to conventional treatments [4]. Although the exact cause of PCOS remains unclear, several contributing factors have been identified, including genetic susceptibility, elevated insulin levels, insulin resistance, obesity, and exposure to environmental or chemical pollutants [5]. The pathogenesis of this disease is predominantly attributed to an increased luteinizing hormone (LH) to follicle-stimulating hormone (FSH) ratio, coupled with enhanced pulsatile secretion of gonadotropin-releasing hormone (GnRH), which collectively disrupt the hypothalamic-pituitary-ovarian axis [6]. PCOS is frequently concomitant with numerous comorbidities, including reproductive dysfunction such as infertility, metabolic disturbances encompassing metabolic syndrome and obesity, insulin resistance leading to type 2 diabetes mellitus, elevated cardiovascular morbidity, neuropsychiatric disorders like depression, respiratory conditions including obstructive sleep apnea, as well as increased risks of endometrial carcinoma and metabolic dysfunction-associated steatotic liver disease (MASLD) [1].

Selected natural substances with therapeutic benefits

The administration of natural bioactive compounds, such as inositols, resveratrol, flavonoids, flavones, vitamins C, E, and D, along with omega-3 fatty acids, may facilitate the amelioration of pathological features associated with PCOS, including oocyte immaturity, insulin resistance, hyperandrogenism, oxidative stress, and inflammatory processes [7]. Polyunsaturated fatty acids like omega-3 and α-linolenic acid help treat PCOS by reducing inflammation, oxidative stress and hormonal imbalances. Additionally, short-chain fatty acids such as butyric acid improve PCOS symptoms by lowering insulin resistance, ovarian inflammation and modulating gut microbiota. Turmeric has curcumin, a compound with biological activity. In patients with PCOS, curcumin helped lower blood glucose levels, improve insulin resistance and reduce hyperandrogenism [8]. Chamomile helps prevent weight gain and lowers cholesterol levels [9]. The bioactive components of flaxseed include alpha-linolenic acid, lignans and dietary fiber.

Lignans and fiber may enhance insulin sensitivity by slowing down glucose absorption and insulin secretion, while omega-3 fatty acids might raise adiponectin levels [10]. Cinnamon contributes to a noticeable enhancement in the regularity of menstrual cycles and ovulation [11]. Fennel is a herb with potential therapeutic effects in the management of PCOS, mainly attributed to its phytoestrogenic compounds, which may exhibit estrogen-like activity and influence hormonal and metabolic regulation [12]. Salvia officinalis extract has been shown to potentially reduce body mass index (BMI) and improve markers of insulin resistance in euglycemic patients [13]. Phytosterols present in Aloe vera have the potential to modulate steroidogenic pathways by regulating the expression of estrogen receptor proteins, decreasing androgen concentrations, increasing estrogen levels, and thereby contributing to the amelioration of pathological features associated with PCOS [14]. Berberine administration is associated with a significant reduction in serum testosterone, free androgen concentrations, fasting blood glucose, fasting insulin, HOMA-IR index, body mass index, lipid profile parameters, and follicle-stimulating hormone (FSH) levels, accompanied by an increase in sex hormone-binding globulin (SHBG) concentrations, as well as improved pregnancy rates and live birth outcomes [11].

Green tea

Green tea (Camellia sinensis) is an unfermented tea that preserves most of the natural compounds found in fresh leaves. It is considered the world's second most popular beverage after water [15]. The medically significant constituents of green tea are primarily its polyphenols, with flavonoids playing a central role. Among these, catechins are the most prominent, accounting for 80%–90% of the flavonoid content [16]. The processing method significantly influences the antioxidant capacity of green tea. Unlike black tea, green tea retains a substantially higher level of catechins, as these compounds are oxidized into theaflavins during black tea's fermentation. Moreover, the antioxidant activity of tea increases proportionally with its catechin content [17]. Green tea contains several catechin derivatives, such as epicatechin (EC), epigallocatechin (EGC), epicatechin gallate (ECG), and epigallocatechin gallate (EGCG), with EGCG exhibiting the strongest anti-inflammatory and anticancer properties [18]. In addition to its rich array of bioactive compounds, green tea contains significant amounts of essential vitamins, notably vitamins B, C, and E, which contribute to its overall nutritional and health-promoting properties [17]. Studies in humans and

animals show that green tea polyphenols, particularly EGCG, exhibit anti-tumor properties by inhibiting cancer cell growth and inducing antioxidant enzymes. Regular consumption of green tea may reduce markers of oxidative DNA damage and lower cancer risk in organs such as the prostate, pancreas, breast and stomach. Importantly, catechins can selectively induce cancer cell death without harming healthy cells [18]. Green tea offers numerous health benefits, including antimicrobial and antioxidant effects, as well as positive impacts on cardiovascular health and oral hygiene [16]. Green tea intake has been linked to a potential reduction in the risk of neurological diseases. Research suggests that consuming green tea may help improve neurological health and mitigate cognitive impairments [19].

Green tea's effects on the symptoms associated with PCOS

Insulin resistance

Women with PCOS frequently exhibit elevated levels of adrenal androgen precursors. This hyperandrogenic state significantly contributes to the hormonal and metabolic imbalances. Levels of sex hormone-binding globulin (SHBG), a glycoprotein that controls the circulation of sex steroids, are typically lower in PCOS, which can be linked to increased risks of insulin resistance and type 2 diabetes [20]. Insulin interacts with a receptor composed of two subunits, α and β, initiating processes essential for glucose uptake and metabolism. In women with PCOS, insulin resistance is a significant concern, characterized by reduced insulin binding in adipose tissue, partly due to decreased levels of the glucose transporter GLUT4. This impairment leads to diminished glucose absorption and sensitivity to insulin. Furthermore, dysfunction of pancreatic β-cells exacerbates this resistance. The proinsulin-to-insulin ratio serves as a useful marker of insulin resistance, with obese and overweight PCOS patients exhibiting elevated levels, contributing to hyperinsulinemia and metabolic disturbances [21]. Epigallocatechin gallate in green tea has been found to suppress the expression of resistin, an adipocyte-derived inflammatory adipokine linked to insulin resistance and heightened cardiovascular disease risk. This suppression likely underlies EGCG's anti-inflammatory effects and its ability to enhance insulin sensitivity. Moreover, a range of preclinical animal studies have consistently demonstrated the beneficial influence of EGCG or green tea extract (GTE) on glucose metabolism, including improved glucose tolerance, reduced serum glucose levels, diminished insulin resistance, and lower HOMA-IR indices [22]. Several studies have demonstrated that

green tea consumption significantly reduces fasting glucose and HbA1c levels. Furthermore, subgroup analyses of well-designed clinical trials have revealed a substantial decrease in fasting insulin concentrations following green tea intake [23] .

Overweight and obesity

Emerging evidence indicates that green tea exerts multifaceted anti-obesity effects through several mechanisms: it impedes lipid emulsification, suppresses adipocyte differentiation, enhances thermogenesis, and reduces food intake [24]. Green tea is rich in catechins, which inhibit the enzymatic degradation of norepinephrine, thereby prolonging its thermogenic and lipolytic effects. This mechanism may contribute to a reduction in body weight. Moreover, green tea has been shown to exert appetite-suppressing properties. It also appears to attenuate nutrient absorption, particularly glucose, by inhibiting key digestive enzymes such as α-amylase and α-glucosidase, as well as by reducing intestinal glucose uptake [25]. Collectively, these actions contribute to improved systemic metabolism and a reduction in fat mass [24]. Studies have demonstrated that tea consumption is associated with a significantly lower mean waist circumference and body mass index (BMI) compared to non-consumption [26].

Hyperandrogenism

Current evidence demonstrates that the green tea-derived catechin, epigallocatechin-3-gallate (EGCG), effectively modulates the biosynthesis and biological activities of androgens and other hormonal regulators. Modulating androgenic pathways and administering epigallocatechin-3-gallate may prove beneficial in managing hormone-associated disorders, including androgenic alopecia and acne [27]. In experimental PCOS animal models, green tea administration has been demonstrated to reduce testosterone levels [28].

Fertility

Polycystic ovary syndrome (PCOS) is a leading contributor to anovulatory infertility in women. In experimental PCOS animal models, green tea administration has demonstrated beneficial effects on reproductive function by promoting ovulation, supporting follicular development, and suppressing cyst formation. These outcomes were reflected in an increased number of growing follicles and corpora lutea, alongside a decreased presence of cystic follicles [29]. Green tea extract (GTE) may improve hormonal imbalances in PCOS by regulating GnRH

pulsatility and gonadotropin secretion. GTE reduces LH, free testosterone, and β-estradiol, while increasing FSH and progesterone, which may enhance ovulation through feedback mechanisms. Animal studies suggest GTE also inhibits aromatase, lowering estradiol synthesis. However, more human studies with varied doses are needed to confirm these effects [30].

Summary

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age worldwide, characterized by hormonal imbalances such as hyperandrogenism, insulin resistance, menstrual irregularities and polycystic ovarian morphology. The syndrome is complex, with multifactorial causes including genetic predisposition, metabolic disturbances, and environmental factors, leading to a wide spectrum of clinical manifestations and comorbidities like infertility, obesity, type 2 diabetes, cardiovascular diseases, and psychological disorders. Given these complexities, natural bioactive compounds have gained attention for their potential therapeutic effects in managing PCOS symptoms. Substances such as inositols, omega-3 fatty acids, curcumin from turmeric, flaxseed lignans, cinnamon, fennel, Salvia officinalis, Aloe vera, berberine, and chamomile exhibit beneficial properties including improvement of insulin sensitivity, reduction of inflammation and oxidative stress, hormonal regulation, and metabolic support. Among these, green tea (Camellia sinensis) has been highlighted due to its high concentration of polyphenols, especially catechins like epigallocatechin gallate (EGCG), which have demonstrated potent antioxidant, anti-inflammatory, anti-obesity, and anti-androgenic effects. Research in both animal models and human studies suggests that green tea can improve insulin resistance by modulating adipokines and enhancing glucose metabolism, support weight management through increased thermogenesis and appetite suppression, and reduce circulating androgen levels, which are critical in PCOS pathophysiology. Furthermore, green tea has shown promise in improving fertility outcomes by promoting ovulation, balancing gonadotropin secretion, and decreasing cyst formation in the ovaries. Despite these encouraging findings, the current body of evidence is still limited by the need for more comprehensive clinical trials to determine optimal dosing, long-term safety, and efficacy in diverse patient populations. Therefore, while green tea and other natural compounds represent a promising complementary strategy for alleviating various PCOS symptoms, they should be considered as part of an integrative approach alongside conventional medical treatments. Continued research is essential to fully

elucidate their mechanisms of action and to establish standardized guidelines for their use in clinical practice, ultimately aiming to improve quality of life and reproductive health in women affected by PCOS.

Disclosure

Author's contribution

Conceptualization: Paulina Grzeszczuk

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Formal analysis: Paulina Grzeszczuk

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Declaration of generative AI and AI assisted technologies

In preparing this work, the authors used ChatGPT (OpenAI) to improve the language, enhance readability, and correct stylistic issues. After using this service, the authors have reviewed and edited the content as needed and accept full responsibility for the substantive content of the publication.

References

[1] Shukla A, Rasquin LI, Anastasopoulou C. Polycystic Ovarian Syndrome. [Updated 2025 May 4]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK459251/

[2] Singh S, Pal N, Shubham S, Sarma DK, Verma V, Marotta F, Kumar M. Polycystic Ovary Syndrome: Etiology, Current Management, and Future Therapeutics. J Clin Med. 2023 Feb 11;12(4):1454. doi: 10.3390/jcm12041454. PMID: 36835989; PMCID: PMC9964744.

[3] Waghmare SV, Shanoo A. Polycystic Ovary Syndrome: A Literature Review With a Focus on Diagnosis, Pathophysiology, and Management. Cureus. 2023 Oct 20;15(10):e47408. doi: 10.7759/cureus.47408. PMID: 38021970; PMCID: PMC10657909

[4] Rababa'h AM, Matani BR, Yehya A. An update of polycystic ovary syndrome: causes and therapeutics options. Heliyon. 2022 Oct 10;8(10):e11010. doi: 10.1016/j.heliyon.2022.e11010. PMID: 36267367; PMCID: PMC9576888.

[5] Yavangi M, Rabiee S, Sanavi Farimani M, Khansary S, Farhadian M, Ranjbar A, Mahmoudi M, Karimi M, Barati S, Barati Mosleh A, Mohammadpour N. The effects of green tea tablets and metformin on ovulation and menstrual cycle regularity in women with polycystic ovary syndrome. J Med Life. 2024 Jan;17(1):109-115. doi: 10.25122/jml-2022-0066. PMID: 38737668; PMCID: PMC11080502.

[6] Sadeghi HM, Adeli I, Calina D, Docea AO, Mousavi T, Daniali M, Nikfar S, Tsatsakis A, Abdollahi M. Polycystic Ovary Syndrome: A Comprehensive Review of Pathogenesis,

Management, and Drug Repurposing. Int J Mol Sci. 2022 Jan 6;23(2):583. doi: 10.3390/ijms23020583. PMID: 35054768; PMCID: PMC8775814.

[7] Iervolino M, Lepore E, Forte G, Laganà AS, Buzzaccarini G, Unfer V. Natural Molecules in the Management of Polycystic Ovary Syndrome (PCOS): An Analytical Review. Nutrients. 2021 May 15;13(5):1677. doi: 10.3390/nu13051677. PMID: 34063339; PMCID: PMC8156462.

[8] Malik S, Saeed S, Saleem A, Khan MI, Khan A, Akhtar MF. Alternative treatment of polycystic ovary syndrome: pre-clinical and clinical basis for using plant-based drugs. Front Endocrinol (Lausanne). 2024 Jan 11;14:1294406. doi: 10.3389/fendo.2023.1294406. PMID: 38725974; PMCID: PMC11081130.

[9] Balkrishna A, Rana M, Mishra S, Srivastava D, Bhardwaj R, Singh S, Rajput SK, Arya V. Incredible Combination of Lifestyle Modification and Herbal Remedies for Polycystic Ovarian Syndrome Management. Evid Based Complement Alternat Med. 2023 Jun 20;2023:3705508. doi: 10.1155/2023/3705508. PMID: 37383339; PMCID: PMC10299884.

[10] Alesi S, Ee C, Moran LJ, Rao V, Mousa A. Nutritional Supplements and Complementary Therapies in Polycystic Ovary Syndrome. Adv Nutr. 2022 Aug 1;13(4):1243-1266. doi: 10.1093/advances/nmab141. PMID: 34970669; PMCID: PMC9340985.

[11] Moini Jazani A, Nasimi Doost Azgomi H, Nasimi Doost Azgomi A, Nasimi Doost Azgomi R. A comprehensive review of clinical studies with herbal medicine on polycystic ovary syndrome (PCOS). Daru. 2019 Dec;27(2):863-877. doi: 10.1007/s40199-019-00312-0. Epub 2019 Nov 18. PMID: 31741280; PMCID: PMC6895349.

[12] Muhammed Saeed AA, Noreen S, Awlqadr FH, Farooq MI, Qadeer M, Rai N, Farag HA, Saeed MN. Nutritional and herbal interventions for polycystic ovary syndrome (PCOS): a comprehensive review of dietary approaches, macronutrient impact, and herbal medicine in management. J Health Popul Nutr. 2025 May 2;44(1):143. doi: 10.1186/s41043-025-00899-y. PMID: 40317096; PMCID: PMC12049039.

[13] Amini L, Mojab F, Jahanfar S, Sepidarkish M, Raoofi Z, Maleki-Hajiagha A. Efficacy of Salvia officinalis extract on the prevention of insulin resistance in euglycemic patients with polycystic ovary syndrome: A double-blinded placebo-controlled clinical trial. Complement

Ther Med. 2020 Jan;48:102245. doi: 10.1016/j.ctim.2019.102245. Epub 2019 Nov 13. PMID: 31987228.

[14] Ashkar F, Rezaei S, Salahshoornezhad S, Vahid F, Gholamalizadeh M, Dahka SM, Doaei S. The Role of medicinal herbs in treatment of insulin resistance in patients with Polycystic Ovary Syndrome: A literature review. Biomol Concepts. 2020 Mar 26;11(1):57-75. doi: 10.1515/bmc-2020-0005. PMID: 32229652.

[15] Zhao T, Li C, Wang S, Song X. Green Tea (*Camellia sinensis*): A Review of Its Phytochemistry, Pharmacology, and Toxicology. Molecules. 2022 Jun 18;27(12):3909. doi: 10.3390/molecules27123909. PMID: 35745040; PMCID: PMC9231383.

[16] Reygaert, W.C. An Update on the Health Benefits of Green Tea. *Beverages* **2017**, *3*, 6. https://doi.org/10.3390/beverages3010006

[17] Musial C, Kuban-Jankowska A, Gorska-Ponikowska M. Beneficial Properties of Green Tea Catechins. Int J Mol Sci. 2020 Mar 4;21(5):1744. doi: 10.3390/ijms21051744. PMID: 32143309; PMCID: PMC7084675.

[18] Farhan M. Green Tea Catechins: Nature's Way of Preventing and Treating Cancer. Int J Mol Sci. 2022 Sep 14;23(18):10713. doi: 10.3390/ijms231810713. PMID: 36142616; PMCID: PMC9501439.

[19] José Manuel Lorenzo, Paulo Eduardo Sichetti Munekata, Phenolic compounds of green tea: Health benefits and technological application in food, Asian Pacific Journal of Tropical Biomedicine, Volume 6, Issue 8, 2016, Pages 709-719, ISSN 2221-1691, https://doi.org/10.1016/j.apjtb.2016.06.010.

[20] Ashkar F, Rezaei S, Salahshoornezhad S, Vahid F, Gholamalizadeh M, Dahka SM, Doaei S. The Role of medicinal herbs in treatment of insulin resistance in patients with Polycystic Ovary Syndrome: A literature review. Biomol Concepts. 2020 Mar 26;11(1):57-75. doi: 10.1515/bmc-2020-0005. PMID: 32229652.

[21] Xu Y, Qiao J. Association of Insulin Resistance and Elevated Androgen Levels with Polycystic Ovarian Syndrome (PCOS): A Review of Literature. J Healthc Eng. 2022 Mar 21;2022:9240569. doi: 10.1155/2022/9240569. PMID: 35356614; PMCID: PMC8959968.

[22] Wang S, Moustaid-Moussa N, Chen L, Mo H, Shastri A, Su R, Bapat P, Kwun I, Shen CL. Novel insights of dietary polyphenols and obesity. J Nutr Biochem. 2014 Jan;25(1):1-18. doi: 10.1016/j.jnutbio.2013.09.001. PMID: 24314860; PMCID: PMC3926750.

[23] Liu K, Zhou R, Wang B, Chen K, Shi LY, Zhu JD, Mi MT. Effect of green tea on glucose control and insulin sensitivity: a meta-analysis of 17 randomized controlled trials. Am J Clin Nutr. 2013 Aug;98(2):340-8. doi: 10.3945/ajcn.112.052746. Epub 2013 Jun 26. PMID: 23803878.

[24] Dinh TC, Thi Phuong TN, Minh LB, Minh Thuc VT, Bac ND, Van Tien N, Pham VH, Show PL, Tao Y, Nhu Ngoc VT, Bich Ngoc NT, Jurgoński A, Thimiri Govinda Raj DB, Van Tu P, Ha VN, Czarzasta J, Chu DT. The effects of green tea on lipid metabolism and its potential applications for obesity and related metabolic disorders - An existing update. Diabetes Metab Syndr. 2019 Mar-Apr;13(2):1667-1673. doi: 10.1016/j.dsx.2019.03.021. Epub 2019 Mar 15. PMID: 31336539.

[25] Abbasi E, Hajhashemy Z, Askari G, Saneei P. Association of Herbal Tea and Follicle-Stimulating Hormone, Anthropometric Parameters, and Fasting Blood Glucose Levels Among Polycystic Ovarian Syndrome Women: A Systematic Review and Meta-Analysis of Clinical Trials. Clin Nutr Res. 2024 Jul;13(3):201-213. https://doi.org/10.7762/cnr.2024.13.3.201

[26] Ohishi T, Fukutomi R, Shoji Y, Goto S, Isemura M. The Beneficial Effects of Principal Polyphenols from Green Tea, Coffee, Wine, and Curry on Obesity. Molecules. 2021 Jan 16;26(2):453. doi: 10.3390/molecules26020453. PMID: 33467101; PMCID: PMC7830344.

[27] Liao S. The medicinal action of androgens and green tea epigallocatechin gallate. Hong Kong Med J. 2001 Dec;7(4):369-74. PMID: 11773671.

[28] Hazimeh D, Massoud G, Parish M, Singh B, Segars J, Islam MS. Green Tea and Benign Gynecologic Disorders: A New Trick for An Old Beverage? Nutrients. 2023 Mar 16;15(6):1439. doi: 10.3390/nu15061439. PMID: 36986169; PMCID: PMC10054707.

[29] Kamal DAM, Salamt N, Zaid SSM, Mokhtar MH. Beneficial Effects of Green Tea Catechins on Female Reproductive Disorders: A Review. Molecules. 2021 May 3;26(9):2675. doi: 10.3390/molecules26092675. PMID: 34063635; PMCID: PMC8124874.

[30] Maleki, V., Taheri, E., Varshosaz, P. *et al.* A comprehensive insight into effects of green tea extract in polycystic ovary syndrome: a systematic review. *Reprod Biol Endocrinol* 19, 147 (2021). https://doi.org/10.1186/s12958-021-00831-z