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Curcumin's Ability to Treat Polycystic Ovary Syndrome (PCOS) in Women

Aya Hassan Ali Shadhan
University of Wasit College of Science Department of Microbiology

Nasreen Hussein Ali Mohammed
Al-Mustansiriya University College of Science Department of Microbiology

Noor Mohammed Masoud Sami kamel
University of Baghdad College of Science Department of Biology

Alaq Saadallah Abdulhamid Amin
Anbar University, College of Science Department of Biology

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Annotation: Polycystic ovary syndrome is known as a hormonal disorder that is common among women at a rate of 20% and occurs when the ovaries produce a high percentage of androgens, which include male sex hormones that are naturally present in women in very small amounts and proportions. Important features of this disease include oxidative stress, inflammation, hyperglycemia, hyperlipidemia, androgenism, and insulin resistance. Metformin, eflornithine, and oral contraceptives are widely used for treatment, not to mention the many side effects, so in this study we talk about something that may have potential in reducing inflammation and curing it permanently. Curcumin is a natural, non-inert polyphenolic compound extracted from turmeric. It has anti-inflammatory and antibacterial activities. It lowers blood sugar levels in a variety of conditions. The

research also provides suggestions for developing appropriate drugs against PCOS from curcumin.

Keywords: curcumin،PCOS, Insulin resistance, Inflammation, Hyperglycemia.

1. Introduction:

Polycystic ovary syndrome (PCOS) is a common, widespread, and genetically diverse endocrine disorder that affects 20% of women of childbearing age in most societies worldwide. The prevalence of this disorder increased by 4.4% in 2017 year. The prevalence rate in the southern United States was approximately 47%, and in South Asia it was high, reaching 52% when compared to other regions. PCOS includes ovarian abnormalities and neuroendocrine changes. PCOS is associated with hormonal imbalances such as insulin resistance (IR), and 95% of women suffer from insulin resistance, which is compounded by visceral fat. The ovaries produce 60% of androgens, while the adrenal glands contribute the remaining 40%. Low levels of FSH (follicle-stimulating hormone) prevent follicles from maturing to reach ovulation. High levels of androgen lead to decreased androgen activity, excessive hair growth, and also ovulation in women, infertility, and cystic hyperplasia. There are new studies talking about an anti-inflammatory, anti-diabetic and anti-obesity agent, curcumin, which has beneficial effects on female reproductive disorders such as polycystic ovary syndrome and other diseases including endometriosis. Suhai et al. found that curcumin supplementation improved serum insulin. Another study showed that curcumin treated women with polycystic ovary syndrome for 12 weeks and thus promoted improvement in body weight and control of blood sugar and lipid levels except for very low-density cholesterol (VLDL) and low-density lipoprotein receptors (LDLR). Curcumin affects blood sugar control in polycystic ovary syndrome. The aim of this research is to describe the effect of a natural plant compound that increases the possibility of ovulation and reduces the side effects of medications. Let us explain a little about the role of zinc when combined with curcumin. Curcumin is a polyphenolic compound, curcumin is extracted from the root of the turmeric plant related to ginger, which appears yellow in color. Curcumin is a natural plant used in medicine and biochemistry as an anti-tumor and blood sugar lowering agent. Zinc plays a role in most insulin-like regulatory and excretory processes. The direct activity of zinc participates in the body's metabolism and depends on its enzymatic attraction. Zinc deficiency impedes the development of T and B cells. Zinc plays a major role in determining the cause of polycystic ovary syndrome and the complications that lead to this syndrome.

2. Curcumin:

Known as curcuminoids, it is isolated from the roots of the turmeric plant and is yellow in color and a type of plant belonging to the ginger family, turmeric is a plant used in medicine and has a history of 4000 years in Indian culture, it was used as a spice for food and also has a major role in religion. Turmeric is used to treat arthritis, conjunctivitis, chickenpox, wound healing and disinfection, skin cancer, liver diseases, expel worms from the body, gallstones in traditional herbal medicine and even to regulate the menstrual cycle and treat complex digestive system problems. C. Long Curcuma longa contains 2% or more curcumin in its chemical composition and 1% BDMC. The most common applications of curcumin are as a compound in nutritional supplements and as a flavoring and coloring agent for food, mustard, and cheese. It is also used as a complex indicator for boron, where it reacts with boric acid to form a red-colored compound called rosocyanin. Continuous use of curcumin for up to 4 months and at high doses of up to 12 grams in the normal human body is considered safe. Curcumin has a protective effect on ovarian tissue. This compound appears to inhibit the growth of endothelial growth factor VEGF, which is

a pro-angiogenic factor and has a strong link to the formation of polycystic ovary syndrome, as it inhibits the formation of blood vessels in the ovary and prevents ovarian fibrosis. It reduces insulin resistance and maintains women's safety.

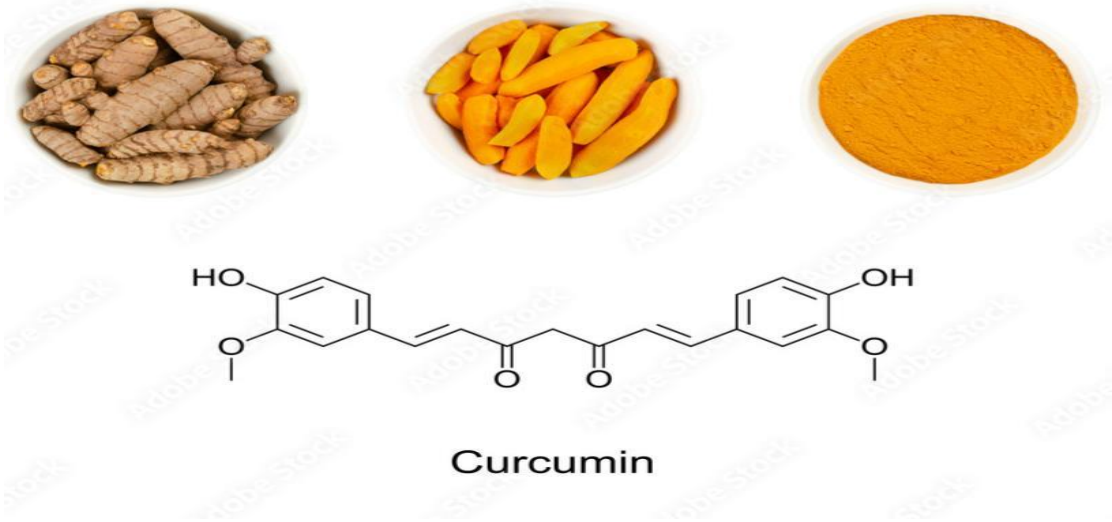

Figure 1: Chemical formula of Curcumin C21H20O6.

Materials and Methods

The methodology employed in this study follows a qualitative and analytical approach to assess the effects of curcumin on polycystic ovary syndrome (PCOS) in women. Data were gathered from peer-reviewed articles, clinical trials, and meta-analyses that explore the pharmacological properties of curcumin in relation to endocrine disorders. A comprehensive literature review was conducted to analyze the impact of curcumin on insulin resistance, hyperandrogenism, inflammation, and metabolic dysfunctions associated with PCOS. The selection criteria for studies included randomized controlled trials, observational studies, and experimental research that assessed biochemical, hormonal, and metabolic parameters after curcumin administration. The primary focus was on evaluating anthropometric changes, inflammatory markers, lipid profiles, and hormonal balance in PCOS patients treated with curcumin. The methodology also included an assessment of curcumin’s bioavailability and synergistic effects when combined with other therapeutic agents, such as zinc. Statistical analyses from the reviewed studies were compared to establish the effectiveness of curcumin in reducing oxidative stress and improving ovarian morphology. Moreover, the safety profile of curcumin was examined by considering adverse effects reported in human and animal studies. The data synthesis process involved cross-referencing findings to determine consistency across multiple research studies, thereby ensuring reliability. This methodological framework provides a systematic evaluation of curcumin as a potential therapeutic agent for PCOS, offering insights into its efficacy and limitations while highlighting areas for future clinical research.

Results and Discusion

3. Effects of curcumin in women to treat polycystic ovary syndrome (PCOS) :

3.1. Anthropometric parameters:

For women with PCOS, they worry about weight gain and their weight gain levels may increase significantly, which increases the risk of obesity. Obesity leads to infertility in PCOS and is a risk factor for type 2 diabetes in women. To solve this problem, it is necessary to control the diet to avoid falling into bigger problems, improve blood sugar levels and exercise. New studies have shown that curcumin has therapeutic effects such as a decrease in body mass index as a result of taking curcumin in patients suffering from obesity. It affects the transmission of a specific signal and improves the regulation of expression through cytokines such as (interleukin-1 beta, leptin), and this work maintains the body's balance. Curcumin stimulates the conversion of white fat cells

into brown fat as a phenotype. Thus, it facilitates the metabolism and energy metabolism in women's bodies.

3.2. Curcumin and CRP:

Previous studies have shown that metabolic diseases are associated with PCOS, such as insulin resistance, type 2 diabetes, obesity, and chronic low-grade inflammation. Also, pro-inflammatory factors can promote the proliferation of granulosa cells and follicular membrane cells of the ovary to produce more androgen and lead to androgen hyperproduction. There are studies that have confirmed the anti-inflammatory properties of curcumin for PCOS in research and animal models. In recent studies, it was found that after taking curcumin, there was a significant improvement in C-reactive protein after treating 27 women with PCOS. C-reactive protein is a member of the pentraxin family in hepatocytes. It has been shown that curcumin has a strong and anti-inflammatory activity in general by inhibiting the activity of IKB kinase and the NF-kB signaling pathway.

3.3. Curcumin and glycolipid metabolism:

The prevalence of metabolic syndrome in PCOS patients is two times higher than in the general population. Both insulin resistance and dyslipidemia in PCOS patients have been shown to be risk factors for type 2 diabetes. The effects of curcumin in improving glucose metabolism and reducing blood lipid levels are evident worldwide. Recently, it has been found that postprandial hyperglycemia is due to unhealthy eating and excessive sugar intake, and this hyperglycemia gradually causes pancreatic beta cell depletion. It has also been shown that fluctuating glucose results from oxidative stress, which in turn leads to endothelial dysfunction and inflammation. An animal study showed that curcumin treatment for eight weeks reduced postprandial blood sugar and HbA1c. However, the positive effect of curcumin in controlling postprandial blood sugar in PCOS patients cannot be denied, due to the limited number of studies. The mechanisms of the lipid-lowering effect of curcumin may include increased expression of unsaturated sphingomyelin, enhanced apoptosis of liver tissue, inhibition of oxidative stress by decreasing levels of malondialdehyde (MDA) and increased levels of superoxide dismutase (SOD). The results may be due to differences in studies, curcumin doses, analytical and descriptive methods. Therefore, more careful interpretation of the results and in-depth studies are needed to verify the validity of the effect of curcumin.

3.4. Curcumin and sex hormone:

Androgen excess is the main cause of the development of PCOS, and persists throughout the reproductive life, and the pathogenesis includes abnormal secretion of gonadal hormones and hyperinsulinemia resulting from insulin resistance. The ovaries The frequency and amplitude of luteinizing hormone pulses function normally to promote androgen synthesis in the theca cell of the ovary and also promote hyperandrogenism in PCOS patients. Hyperinsulinemia causes increased androgen production in the adrenal cortex and follicles by stimulating the secretion of luteinizing hormone and reducing the production of SHBG, which leads to increased androgen levels, which in turn leads to the characteristic clinical manifestations of acne and hirsutism. Curcumin has not yet been proven to have a strong effect on female reproductive hormones, however, several studies have provided justification for further exploration. Most previous research has shown that curcumin may have an effect in reducing androgen levels in PCOS patients.

4. Adverse effects:

No serious side effects occurred as a result of our study, and only a few patients complained of minor side effects such as mild gastrointestinal discomfort and itching. Besides, we noticed that biochemical parameters such as red blood cells, white blood cells, chromium, aspartate aminotransferase, and alanine aminotransferase showed no significant abnormalities in expression, which means that there was no obvious harm to blood routine, liver and kidney function, which is

one of the advantages of this meta-analysis. Besides, a randomized, double-blind, placebo-controlled clinical trial found that at a clinical dose of 2400 mg/day, curcumin supplements could lower systolic blood pressure and had no effect on cardiometabolic risk parameters. In the United States, curcumin has been approved as safe by the Food and Drug Administration (FDA). From this evidence, it is clear to us that curcumin is generally well tolerated and safe, although more clinical studies are needed to confirm the safety of curcumin in long-term treatment.

Conclusion:

The findings of this study underscore the potential therapeutic benefits of curcumin in managing polycystic ovary syndrome (PCOS), particularly in mitigating oxidative stress, reducing insulin resistance, regulating lipid metabolism, and improving hormonal balance. The evidence suggests that curcumin exhibits anti-inflammatory, anti-diabetic, and lipid-lowering properties, which contribute to its positive effects on ovarian morphology and menstrual cycle regulation. These findings imply that curcumin could serve as a complementary or alternative treatment for PCOS, potentially reducing reliance on conventional medications that often present adverse side effects. However, while curcumin appears to be well-tolerated, variations in dosage, bioavailability, and long-term effects require further exploration. Future research should focus on large-scale, randomized controlled trials to establish standardized dosing, assess potential interactions with existing PCOS treatments, and investigate its role in broader metabolic and reproductive health contexts. Additionally, studies on curcumin's synergistic effects with micronutrients such as zinc could provide deeper insights into optimizing its therapeutic potential for PCOS management.

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