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Non-pharmacological therapies for the treatment of Polycystic Ovary Syndrome: a systematic review

Isabella Ayache Scordamaglio[1], Louise de Souza Teresani[1], Gisela Garcia Viana[1], Maria Carolina Caporale Madi[2], Jonas Moraes-Filho[1,3]

[1]Medicine Course, Santo Amaro University, São Paulo, Brazil.
[2]Gynecologist by FEBRASGO, São Paulo, Brazil.
[3]Postgraduate Program in One Health, Santo Amaro University, São Paulo, Brazil.

ABSTRACT

OBJECTIVE

To evaluate the effectiveness of non-pharmacological therapies in improving the symptoms of Polycystic Ovary Syndrome (PCOS), with an emphasis on hormonal regulation, weight control, and quality of life.

METHODS

Systematic review of articles published between 2019 and 2024 in the PubMed and LILACs databases, using the terms "polycystic ovary syndrome" in combination with "diet", "supplementation" and "treatment". Duplicate studies, articles in languages other than Portuguese or English, research focused on pharmacological treatments and studies unrelated to the topic were excluded, resulting in 27 articles.

RESULTS

Lifestyle changes (LCM) should be the first line of treatment for PCOS, since they present several benefits for the metabolic and hormonal regulation of patients. These measures should include nutritional counseling, physical activity, smoking cessation, sleep regulation and focusing on general well-being.

CONCLUSIONS

Non-drug therapies are essential in the management of polycystic ovary syndrome and can significantly contribute to weight loss, hormonal regulation, reduction of insulin resistance and improvement of patients' quality of life. However, it is essential that more rigorous studies be conducted to deepen the understanding of the efficacy and safety of these interventions.

KEYWORDS

Polycystic ovary syndrome; Diet; Supplementation

Corresponding author
Jonas Moraes-Filho
Santo Amaro University, São Paulo, Brazil
Rua Prof. Eneas de Siqueira Neto, 340. Jardim das Imbuias. São Paulo/SP. Cep: 04829-300
E-mail: jmfilho@prof.unisa.br
ORCID: https://orcid.org/0000-0002-4734-9512

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INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is the most common endocrine disorder among women of reproductive age, with prevalence rates ranging from 6% to 13%[1], hyperandrogenism.[2] Many extrinsic and intrinsic factors are associated with an increased risk of developing this syndrome; however, its etiology and pathophysiology are not yet fully understood[3]. The combination of hereditary and environmental factors, such as exposure to endocrine disruptors, may play an important role. The four main physiological causes of PCOS include disturbances in gonadotropin hormone synthesis, insulin resistance, the influence of excess body fat, and alterations in metabolic pathways related to PCOS, mechanisms that are directly interconnected.[4]

The Rotterdam criteria are used for diagnosing PCOS, and the patient must present at least two of three criteria: oligomenorrhea or amenorrhea; clinical and/or laboratory hyperandrogenism; and the presence of 12 or more follicles measuring 2 to 9 mm in diameter, or an ovarian volume greater than 10 cm^3 on transvaginal or pelvic ultrasound.5,6 Additionally, a serum anti-Müllerian hormone level > 4.5 ng/mL, combined with clinical features, can substitute the ultrasound criterion and establish the diagnosis.[1]

The main clinical manifestations include oligomenorrhea, amenorrhea, hyperandrogenism, and obesity.[6] The treatment comprises weight loss, physical activity, specific diets, and pharmacological options such as oral contraceptives, ovulation inductors, and antidiabetic agents, aiming to regulate hormones and prevent complications. However, due to the chronic and incurable nature of PCOS, which can lead to complications such as infertility and type 2 diabetes, it is essential to highlight non-pharmacological therapies, such as dietary changes, exercise, and stress management. These approaches are gaining attention because they have fewer side effects, promote metabolic benefits, and improve long-term adherence. 3,7 Therefore, this study aims to analyze non-pharmacological therapies for women with PCOS, deepening the understanding of how these practices influence inflammatory regulation and overall health.

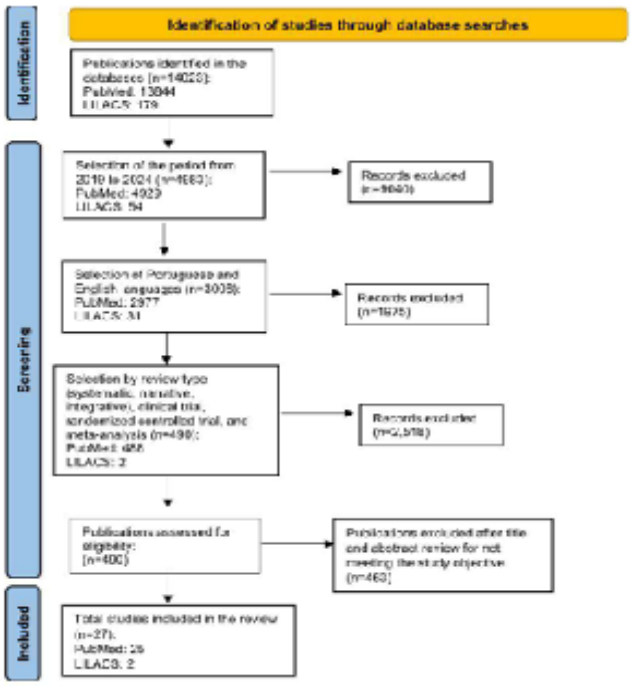
METHODS

This systematic review was conducted following the PRISMA protocol to ensure greater methodological rigor and transparency in the study selection process. The research question was formulated using the PICO model: Do women with Polycystic Ovary Syndrome (PCOS) who use non-pharmacological therapies experience an improvement in symptoms related to PCOS compared to conventional treatments or no treatment? In this model, the components were defined as follows: women with PCOS (population), non-pharmacological therapies (intervention), comparison with conventional treatments or no treatment (comparison), and symptom improvement related to PCOS, menstrual cycle regulation, weight loss, hormonal changes, and quality of life (outcomes). Based on this, inclusion and exclusion criteria were established to guide the study selection.

The search was conducted in the PubMed and LILACS databases using free-text terms in English, such as "polycystic ovary syndrome", "diet", "supplementation", and "treatment" combined with the Boolean operator AND, to direct the search according to the study's objective. Controlled descriptors from DeCS/MeSH were not used, which may be a limitation since the search could have been less comprehensive and precise. Initially, 14,023 articles were identified. After removing duplicates, studies in languages other than Portuguese or English, and studies that did not fall into the following research types: systematic review, narrative review, integrative review, randomized controlled clinical trial, clinical trial, and meta-analysis, as well as those addressing pharmacological treatments or non-related to the topic, 27 studies were included in the final analysis.

Article selection was performed in two stages. In the first stage, two independent reviewers assessed the titles and abstracts of retrieved articles to determine eligibility based on predefined criteria. In the second stage, the full texts of the selected articles were analyzed. Discrepancies between reviewers were resolved by consensus or by involving a third reviewer, as illustrated in Figure 1 and Table 1.

Figure 1: Flowchart for the selection of articles to be reviewed



Source: Authors(2025)

Table 1: Selected articles for analysis after applying inclusion and exclusion criteria

STUDY	YEAR	DESIGN	RESULTS	CONCLUSION
PAOLI [4]	2020	CT	The ketogenic diet reduced weight, glucose, insulin, triglycerides, total cholesterol, and LDL, and increased HDL. The LH/FSH ratio, LH, and total testosterone levels decreased.	The ketogenic diet may be an effective treatment.
SZCZUKO [6]	2021	NR	Low-GI diets improve HOMA-IR, testosterone, fasting insulin, total cholesterol, LDL, triglycerides, and waist circumference.	Improving fertility, controlling hirsutism, managing carbohydrate and lipid disorders, and reducing insulin resistance are essential in the management of PCOS.

COWAN [8]	2023	NR	Low-GI diets, protein intake, sleep quality, and physical activity provide benefits in PCOS.	Behavioral and psychological interventions provide greater autonomy over treatment.
SINGH [9]	2023	IR	New therapies for PCOS offer approaches to metabolic and reproductive aspects.	Emerging therapies open new perspectives for effective treatment.
KAZEMI [10]	2021	SRMA	Low-GI diets showed benefits but did not impact fasting blood glucose, cholesterol, weight, and free androgen index.	There was improvement in cardiometabolic and reproductive parameters of PCOS.
SHISHEHGAR [11]	2019	SRMARCT	The low-GI diet reduced weight and total testosterone, increased SHBG, and improved menstrual irregularity and acne.	The low-GI diet has beneficial anthropometric and metabolic effects.
PATTEN [12]	2020	SRMA	Improvements in PCOS are more closely associated with exercise intensity than with dose.	Physical exercise is effective in treatment.
FARIA [13]	2021	IR	Physical exercise combined with a balanced diet is essential in treatment.	It is possible to minimize symptoms and prevent complications of PCOS.
MOJAVER-ROSTA MI [14]	2019	IR	Melatonin improves oocyte quality and corrects hormonal imbalances in PCOS.	Melatonin may alleviate metabolic dysfunction.
DINICOLAN-TONIO [15]	2022	IR	Myo-inositol improves insulin sensitivity, ovulatory function, and reduces diabetes--related complications in PCOS.	Myo-inositol is recommended for patients with PCOS.
KIANI [16]	2022	IR	Curcumin, vitamin D, CoQ10, and inositol improved metabolic parameters in PCOS.	These substances show benefits for the treatment of PCOS.
GENAZZANI [17]	2019	RCT	MYO and ALA reduced insulin resistance, and together optimized hormonal modulation, insulin resistance, and metabolic profile.	The combination of MYO and ALA can improve the metabolic profile of patients.
ALESI [18]	2022	IR	Vitamins, minerals, and complementary approaches may be beneficial for the treatment of PCOS.	Supplementation and complementary therapies may improve aspects of PCOS.
TAGHIZADEH [19]	2021	RCT	CoQ10 reduced serum levels of inflammatory markers.	Supplementation showed benefits on inflammatory markers in PCOS.
AVELINO [20]	2024	MA	Vitamin D reduced malondialdehyde and total testosterone levels and increased total antioxidant capacity. Despite improvement in hirsutism, there was no significant reduction in SHBG and androgen levels.	Vitamin D is promising for the treatment of PCOS.
MIAO [21]	2020	MA	Vitamin D improved total testosterone, insulin resistance, pancreatic beta-cell function, total cholesterol, and LDL. No significant effects were observed on BMI, DHEAS, triglycerides, or HDL.	Vitamin D proved beneficial in patients with PCOS
CHIEN [22]	2021	SRMARCT	Curcumin improves fasting glucose, insulin, and HOMA-IR in women with PCOS, increases HDL, and reduces total cholesterol, with no significant changes in LDL and triglycerides.	Curcumin may improve glycemic and lipid control in patients with PCOS.
ABDELAZEEM [23]	2022	SRMARCT	Curcumin improved glycemic control and reduced total cholesterol, but there were no significant differences in LDL, HDL, sex hormones, or body weight.	Curcumin offers benefits for patients with PCOS.

SALEHPOUR [24]	2019	CT	L-carnitine reduced insulin resistance, LDL, and BMI, and also increased HDL levels. It also regulated menstrual cycles and reduced hirsutism.	It is possible to minimize symptoms and prevent complications of PCOS.
HAMILTON [25]	2019	IR	There is a possible association between serum magnesium concentrations and insulin resistance in women with PCOS.	Adequate magnesium levels may improve insulin resistance.
NASIADEK [26]	2020	IR	In women with PCOS, zinc improves the lipid profile and insulin resistance.	Myo-inositol is recommended for patients with PCOS.
OLIVEIRA [27]	2023	NR	Acupuncture was more effective with more sessions, regular intervals, and ovarian innervation points. Laser acupuncture, combined with lifestyle modification (LSM), improved BMI, serum insulin, and HOMA-IR, while electroacupuncture reduced triglycerides and LDL.	Acupuncture proved effective in the treatment of PCOS.
WU [28]	2020	SRMARCT	Acupuncture restored the menstrual period and reduced LH and testosterone levels.	Acupuncture proved effective in the treatment of PCOS.
MOHSENI [29]	2020	cRCT	Yoga reduced hirsutism, abdominal circumference, and hip circumference.	Supplementation and complementary therapies may improve aspects of PCOS.
SHELE [30]	2020	SR	Yoga may benefit androgen levels, but there is limited information on its effect on adipokines.	Supplementation showed benefits on inflammatory markers in PCOS.
VERMA [31]	2021	SRMA	Beneficial effects of yoga on reproductive health outcomes, such as menstrual regularity and clinical hyperandrogenism.	Yoga may have beneficial effects in women with PCOS.
OBERG [32]	2020	RCT	The behavioral modification program reduced anxiety and depression in overweight patients with PCOS.	Psychological well-being improves the quality of life of overweight women with PCOS.

Legend: CT: clinical trial; NR: narrative review; IR: integrative review; SRMA: systematic review with meta-analysis; RCT: randomized clinical trial; MA: meta-analysis; SRMARCT: systematic review with meta-analysis of randomized clinical trials; cRCT: controlled randomized clinical trial; SR: systematic review; LDL: low-density lipoprotein; HDL: high-density lipoprotein; LH: luteinizing hormone; FSH: follicle-stimulating hormone; GI: glycemic index; HOMA-IR: homeostasis model assessment of insulin resistance; SHBG: sex hormone-binding globulin; DM: diabetes mellitus; CoQ10: coenzyme Q10; MYO: myo-inositol; ALA: alpha-lipoic acid; BMI: body mass index; DHEAS: dehydroepiandrosterone sulfate.

Source: Authors (2025)

Lifestyle modification (LM) should be the first-line treatment for PCOS: nutritional counseling, physical activity, smoking cessation, sleep regulation, and overall well-being focus.[6] For women with overweight or obesity, a weight loss of 5 to 10% is recommended, along with a calorie-restricted diet.[8]

One of the most recommended non-pharmacological treatments for PCOS is an appropriate diet. Paoli et al.[4], Szczuko et al.[6], Cowan et al.[8], and Singh et al.[9] demonstrated that low glycemic index (GI) diets improve insulin sensitivity, testosterone levels, and sex hormone-binding globulin (SHBG), as well as reduce HOMA-IR (a measure of insulin resistance) and waist circumference. Protein-rich diets promote weight loss, BMI (body mass index), body fat measurements, and improvements in insulin sensitivity and blood lipids, although with less impact compared to low GI diets. Conversely, Kazemi et al.[10] did not observe significant effects on these parameters, while Shishehgar et al.[11] found no weight reduction but noted decreases in testosterone, increased SHBG,and improved menstrual irregularity.

The DASH (Dietary Approaches to Stop Hypertension) diet has also been associated with improvements in insulin-resistance and hormonal health.[8] Eliminating saturated fatty acids is considered essential for these outcomes, according to Szczuko et al.[6] Another option is the ketogenic diet, which reduces body weight, BMI, fat mass, fasting blood glucose, HOMA-IR, triglycerides, total cholesterol, and LDL (low-density lipoprotein), while increasing HDL (high-density lipoprotein). 4,9

In addition to diet, aerobic exercises and strength training are among the most recommended measures for women with PCOS.[12] Cowan et al.[8], Singh et al.[9], Patten et al.[12], and Faria et al.[13] agree that these exercises improve insulin resistance, lipid profiles, and body composition. Resistance exercises also offer benefits but may have adverse effects on BMI. Supervised interventions of short duration are more effective, and exercise intensity has proven to be more impactful than dose, leading to improvements in menstrual frequency and ovulation, though they did not significantly increase pregnancy rates.[8]

Estrogen and progesterone are essential for sleep quality.[8] Chronic sleep deprivation increases the risk of insulin resistance, obesity, type 2 diabetes, and cardiovascular diseases. Szczuko et al.[6] and Mojaverrostam et al.[14] emphasize that melatonin is crucial for the maintenance of ovarian follicles. Both estrogen and progesterone are vital for good sleep quality.[8]

In women with PCOS (insulin resistance), there is a deficiency of myo-inositol (MYO) and an excess of D-chiro-inositol (DCI). DiNicolantonio et al.15 and Kiani et al.[16] show that MYO supplementation improves oocyte maturation, LH (luteinizing hormone) levels, the LH:FSH (follicle-stimulating hormone) ratio, testosterone, androstenedione, hyperinsulinemia, and HOMA-IR. DCI reduces insulin resistance, decreases free testosterone, and improves ovulation. The combination of MYO and DCI enhances oocyte maturation, increases pregnancy rates, and is better tolerated than metformin, according to Szczuko et al.[6] and Kiani et al.[16] Regarding supplementation, alpha-lipoic acid (ALA) improved insulin resistance in all women, and the combination of MYO and ALA enhanced hormonal modulation, insulin sensitivity, and metabolic profile of patients.17

Folic acid benefits women with PCOS who have an increased cardiovascular risk.[18] Studies by Alesi et al.[18] indicated that folic acid supplementation reduced insulin, HOMA-IR, improved lipid profiles, and increased antioxidant capacity, while coenzyme Q10 reduced endothelial dysfunction, overweight, and inflammatory markers in women with PCOS, as shown by Taghizadeh et al.[19] and Kiani et al.[16]

Use of metformin in women with PCOS can cause deficiencies in B-complex vitamins, leading to elevated plasma homocysteine levels, which may worsen insulin resistance, as reported by Alessi et al.[18] However, patients taking B6 and B12 vitamins alongside metformin showed reductions in plasma homocysteine levels.[18]

Vitamin D deficiency also contributes to insulin resistance. Alesi et al.[18] highlight that supplementation improves insulin resistance and lipid profiles. Singh et al.[9] demonstrated that combining vitamin D, calcium, and metformin improves menstrual regularity, follicle maturation, and reduces hirsutism. Avelino et al.[20] reported that vitamin D decreases malondialdehyde and total testosterone levels and increases antioxidant capacity. Miao et al.[21] indicated that higher doses of vitamin D improve insulin sensitivity and hormonal levels.

Singh et al.[9], Kiani et al.[16], Chien et al.[22], and Abdelazeem et al.[23] demonstrated that curcumin regulates the menstrual cycle, reduces hyperandrogenism, improves fasting blood glucose and insulin levels, increases HDL, and decreases total cholesterol. Salehpour et al.[24] found that L-carnitine reduced fasting blood glucose, insulin, triglycerides, LDL, HOMA-IR, BMI, and made menstrual cycles more regular. Additionally, Alesi et al.[18], Hamilton et al.25, and Nasiadek et al.[26] agree that magnesium, zinc, and selenium are beneficial in treating PCOS, improving insulin sensitivity, hormonal profile, menstrual cycle regulation, and reducing hirsutism and oxidative stress.

Acupuncture decreased insulin resistance, BMI, fat mass, and abdominal circumference.[18] Oliveira et al.27 found that its effectiveness increases with more sessions and points of ovarian innervation. The combination of acupuncture and LMV improved BMI, serum sulin, and HOMA-IR; electroacupuncture reduced triglycerides and LDL, especially when combined with contraceptives. Although no significant changes were observed in pregnancy and ovulation rates, improvements in menstrual regularity and reductions in LH and testosterone were noted, as reported by Wu et al.[28] and Chien et al.[22]

Yoga provides benefits beyond conventional exercises. Mohseni et al.[29] showed that 90 minutes of daily yoga for six weeks reduces hirsutism, abdominal, and hip circumference. Shele et al.[30] demonstrated reductions in testosterone and insulin resistance. Verma et al.[31] observed improvements in menstrual regularity and reductions in clinical hyperandrogenism, fasting insulin, and HOMA-IR.

The 2023 PCOS guidelines emphasize quality of life management and emotional well-being. Cowan et al.[8] showed that combining cognitive-behavioral therapy (CBT) with LMV resulted in better weight control and symptom reduction compared to LMV alone. Oberg et al.[32] also found that CBT helped reduce overweight in women with PCOS.

CONCLUSION

Non-pharmacological therapies, such as lifestyle changes, nutritional interventions, supplementation, yoga, acupuncture, and cognitive-behavioral therapy, play a significant role in managing PCOS. These approaches contribute to weight loss, hormonal regulation, improvement of insulin resistance, and psychological well-being, thereby positively impacting patients' quality of life. Emphasizing the importance of individualized medical follow-up and, when necessary, the use of combined pharmacological treatments is essential. Further robust studies are still needed to deepen the understanding of the efficacy and safety of these interventions.

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