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THE IMPACT OF SPORT ON PCOS

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ABSTRACT

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders in women of reproductive age and has a significant impact on a wide range of metabolic, hormonal, and psychosocial disturbances. Symptoms of PCOS include menstrual irregularities, hyperandrogenism, infertility, overweight or obesity, as well as an increased risk of insulin resistance and cardiovascular disease. Numerous scientific studies emphasize the important role of regular physical activity as a non-pharmacological treatment strategy in women with PCOS. The aim of this article is to evaluate the impact of regular physical activity on the course of PCOS, with particular emphasis on metabolic and hormonal parameters, body composition, physical fitness, and quality of life in women affected by this condition. A review of the available literature indicates that both aerobic and resistance training, when performed regularly and at appropriate intensity, have a significant positive effect on improving insulin resistance, cardiorespiratory fitness, and body composition, contribute to reductions in body fat, and reduce the severity of clinical symptoms of PCOS. Additionally, regular physical activity reduces the occurrence of both anxiety and depressive symptoms, thereby exerting a beneficial effect on mental health. The obtained data confirm that participation in sports and engagement in regular physical activity constitute an important element of comprehensive therapeutic management in women with PCOS and should be considered a fundamental form of supportive treatment.

KEYWORDS

Exercises, PCOS, Obesity, Androgens, Hyperandrogenism, Insulin Resistance

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Introduction

PCOS (polycystic ovary syndrome) is one of the most common hormonal disorders in women of reproductive age [1]. In polycystic ovary syndrome (PCOS), the primary pathological mechanism is considered to be excessive ovarian androgen production, which is exacerbated by abnormal feedback regulation of pulsatile gonadotropin-releasing hormone (GnRH) secretion, leading to increased luteinizing hormone (LH) secretion and a relative deficiency of follicle-stimulating hormone (FSH) [2]. This hormonal dysregulation contributes to endocrine disturbances, irregular ovulation, and alterations in ovarian function, leading to the development of acne, hirsutism, male-pattern hair loss, irregular menstrual cycles, and reduced fertility. Although the exact etiology of PCOS remains unknown, key contributing factors include insulin resistance and elevated androgen levels [1,3]. To establish a diagnosis of PCOS, at least two of the following three criteria must be met: polycystic ovaries visible on ultrasound examination, irregular or absent ovulation, and clinical or laboratory signs of excess androgens [4]. Women with polycystic ovary syndrome (PCOS) are characterized by an increased risk of developing conditions such as obesity, type 2 diabetes, non-alcoholic fatty liver disease (NAFLD), cardiovascular diseases, anxiety, depression, and other mood disorders [5]. Insulin resistance, which frequently occurs in women with PCOS, is associated with elevated levels of inflammatory markers such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α) [6].

Aim of the work

The aim of this study is to evaluate the impact of sports and regular physical activity on the course of polycystic ovary syndrome (PCOS), with particular emphasis on their effects on metabolic and hormonal parameters, body composition, physical fitness, and the quality of life of women affected by this condition.

Materials and methods

The analysis included scientific publications from 1975 to 2024 concerning the impact of physical activity and exercise on the course of polycystic ovary syndrome (PCOS). The literature review was conducted using the PubMed and Google Scholar databases, with appropriate keywords related to PCOS, physical activity, aerobic training, resistance training, and combined training. The analysis included studies assessing the effects of various forms of physical activity on metabolic, hormonal, and anthropometric parameters, cardiorespiratory fitness, and quality of life in women with PCOS.

Results

The treatment of women with PCOS is primarily based on symptomatic therapy, addressing menstrual cycle disorders, hirsutism, infertility, and overweight or obesity, while causal treatment is not always necessary [7]. Regardless of the therapy used, a healthy lifestyle and regular physical activity provide significant health benefits and should be an integral part of standard treatment [8]. The positions presented in the scientific literature highlight a broad perspective from which a range of beneficial effects of physical activity in women with PCOS emerges. One study demonstrated that women who engaged in regular physical activity experienced reduced insulin resistance, lower fasting insulin levels, and improvements in metabolic parameters such as HOMA-IR and lipid profile, including decreased total cholesterol, LDL cholesterol, and triglyceride levels, compared to control groups that did not participate in the exercise program [9]. Moreover, numerous studies have shown that in women with PCOS, exercise programs based on aerobic training, especially when combined with individually tailored dietary guidance, lead to significant reductions in body weight, decreased body fat percentage, and a reduction in waist circumference [9], which is of significant importance for improving metabolic parameters and overall health. The analysis of the results of conducted studies showed that moderate and vigorous physical activity positively affects maximal oxygen uptake (VO_2max), which is an important parameter for assessing improvements in cardiovascular function in women with PCOS [10]. Although the available scientific evidence is limited, some studies suggest that both aerobic and resistance training improve insulin sensitivity, positively affecting insulin resistance, and may potentially influence androgen levels [5].

Discussion

The results presented in this paper confirm the significant role of physical activity as one of the key components of non-pharmacological management in women with polycystic ovary syndrome (PCOS). The analysis of available studies indicates that regular exercise has a multifaceted impact on the course of the disease, including improvements in metabolic and hormonal parameters, body composition, physical fitness, and quality of life. It is important to emphasize that physical activity also contributes to better mental health, enhancing health-related quality of life and alleviating symptoms of depression and anxiety in women with PCOS [11]. This is particularly important, as women with PCOS are at an increased risk of mood disorders, which may further impede adherence to therapeutic recommendations and participation in physical activity.

Physical Fitness and Body Composition

PCOS may be associated with "mild hyperandrogenism," a moderate elevation of androgen levels. Studies have shown that athletes more frequently exhibit increased androgen concentrations, which may be related to greater muscle mass and bone density and could positively influence performance in certain sports. Recent data suggest that testosterone—a hormone that increases muscle mass and strength—also stimulates red blood cell synthesis, enhances competitiveness, and improves physical performance in women [2]. Regular physical activity, particularly appropriately tailored and intensive aerobic and resistance training, has a beneficial effect on body composition and cardiorespiratory fitness in women with PCOS. Aerobic exercise combined with dietary guidance can reduce BMI, waist circumference, and body fat percentage, while improving VO_2max (a measure of aerobic capacity) compared to standard care [12].

Insulin sensitivity

The observed changes in body composition and physical fitness are associated with molecular mechanisms induced by regular physical activity. It has been shown that exercise activates intracellular signaling pathways, particularly the PI3K–Akt pathway, which plays a significant role in insulin signaling and the regulation of glucose transport into skeletal muscles. Studies conducted on animal models with PCOS have demonstrated that physical training reduces the expression of type 1 5α-reductase while simultaneously activating the PI3K–Akt pathway, which increases the expression of the glucose transporter GLUT4, thereby facilitating glucose uptake by muscle cells [13]. These mechanisms may partially explain the improvement in insulin sensitivity observed in women with PCOS who engage in regular physical activity. In a case–control study, it was shown that higher levels of physical activity in women with PCOS were significantly associated with lower HOMA-IR values, independent of dietary habits, highlighting the crucial role of exercise in modulating insulin resistance in this patient population [14]

Reduction of Body Weight and Adipose Tissue

An important element in the pathophysiology of PCOS is an excessive amount of visceral adipose tissue, which is a source of pro-inflammatory cytokines such as TNF-α, IL-6, and CRP. These cytokines can negatively affect the function of ovarian follicles and disrupt hormonal balance [15]. Studies have shown a relationship between low-grade chronic inflammation, hyperandrogenism, and PCOS, which promotes further accumulation of adipose tissue and exacerbates metabolic disturbances [16]. In this context, physical activity takes on particular importance as a non-pharmacological intervention that affects both metabolic and inflammatory parameters. Analyses conducted indicate a beneficial effect of regular physical exercise, while also highlighting that higher-intensity training may exert the strongest impact on improving cardiorespiratory fitness, body composition, and reducing insulin resistance. It has been shown that women with PCOS who engage in systematic aerobic training have lower levels of visceral fat, even when there are only minor changes in total body weight. A reduction in visceral adipose tissue, particularly around internal organs, may help limit chronic inflammation, thereby improving the clinical condition of these women [10]. Moreover, studies examining various forms of regular physical activity, including aerobic and resistance training, have shown that they lead to a significant reduction in body fat percentage and BMI in women with PCOS. These effects contribute to better weight management, improved metabolic parameters, and a reduced risk of long-term health complications associated with polycystic ovary syndrome [17].

Effects on endocrine function

In a randomized controlled study involving adolescent girls with polycystic ovary syndrome (PCOS), a 12-week aerobic exercise program conducted three times per week resulted in statistically significant reductions in circulating levels of testosterone, estrogen, and prolactin, alongside improvements in lipid profile parameters such as lower total cholesterol, triglycerides, and LDL cholesterol, and higher HDL cholesterol, compared with a non-exercise control group. These findings support the potential endocrine and metabolic benefits of structured aerobic training in young women with PCOS [18]. Current evidence suggests that practicing yoga may contribute to reductions in circulating testosterone levels in women. Exercises that promote skeletal muscle development may enhance tissue utilization of this hormone, consequently leading to decreased serum testosterone concentrations [5]. Clinical evidence indicates that lifestyle interventions combining structured physical activity and dietary modification may modulate reproductive endocrine profiles in women with PCOS, including the LH:FSH ratio, circulating sex hormone-binding globulin (SHBG), and free testosterone levels; however, observed hormonal changes are not uniformly statistically significant across studies [19].

Cardiovascular risk

PCOS is associated with an increased risk of, among others, dyslipidemia, stroke, hypertension and metabolic obesity [20]. Study findings suggest that regular physical activity contributes to a reduction in cardiovascular risk and abdominal obesity, as well as to improvements in cardiorespiratory fitness in women with PCOS [21]. Analysis of the studies indicates that physical exercise has a beneficial effect on factors used in the assessment of cardiovascular risk, including fasting glucose levels, total blood cholesterol, systolic blood pressure, waist circumference, and the waist-to-hip ratio [22].

Beneficial Effects of Physical Exercise

Available scientific evidence indicates that regular physical activity plays a significant role in improving the quality of life of women with PCOS, while also contributing to the alleviation of clinical symptoms of the condition, including metabolic and hormonal disturbances, and reducing the incidence of depressive and anxiety disorders [11].

Conclusions and summary:

Regular physical activity is a highly important, evidence-based component of therapeutic management for women with polycystic ovary syndrome (PCOS). Numerous studies indicate clinically significant benefits of physical activity for metabolic and cardiorespiratory parameters in women with PCOS. It has been shown that engaging in exercise promotes fat loss, reduces body weight, improves physical fitness, and positively affects various metabolic parameters. Physical activity leads, among other effects, to improvements in metabolic markers (e.g., leptin, insulin, and lipid levels), reductions in BMI and body weight, and enhanced cardiovascular fitness, as evidenced by increases in VO_2max [23]. To achieve optimal therapeutic effects, physical activity should be performed regularly and individually tailored to the patient in terms of type and intensity, incorporating both aerobic exercises and resistance training. It should also be emphasized that improvements in physical fitness and body composition, even without significant weight loss, are particularly important for enhancing quality of life in women with PCOS.

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