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The role of diet and physical activity in PCOS - A Quick Review

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Abstract

Introduction: Polycystic Ovary Syndrome (PCOS) is a condition commonly found in young women. It is associated with many possible health consequences, ranging from acne, hirsutism, and obesity to fertility problems and even the development of endometrial cancer. Treatment is tailored to the individual, depending on various complications and needs. However, it is important to note that in most cases, the first recommended step is lifestyle modification. Key components of this include a healthy diet and physical activity. These recommendations are often overlooked or undervalued, with patients frequently expecting immediate pharmacological treatment and not believing in the potential effects of lifestyle changes.

Aim of Study: The purpose of this review is to explore and emphasize the crucial role of diet and physical activity in the management of women with PCOS.

Material and methods: PubMed and Google Scholar databases were used for the research.

Results and Conclusions: A well-balanced diet and regular physical activity play a crucial role in both the prevention and management of women with PCOS. While there are no specific diets or forms of physical activity recommended, research shows that any modifications towards eliminating unhealthy diet habits and sedentary lifestyles can significantly impact the quality of life for these women.

Keywords: polycystic ovary syndrome, diet, physical activity

INTRODUCTION

Polycystic ovary syndrome (PCOS), also known as Stein-Leventhal syndrome is a commonly occurring disorder affecting many women. It is characterized by a range of hormonal and metabolic disturbances. While it predominantly affects women of reproductive age, it can develop at any stage of life [1-3]. The scale of the problem is significant, as this condition affects approximately 10 out of every 100 women [2, 4, 5].

The causes of PCOS development are complex and not fully understood. There are various theories attempting to explain the etiology of the condition. Multiple internal and environmental

factors may be responsible for the disease [3,5]. It has been observed that new cases of PCOS often emerge in families where the condition is already present [3].

The pathophysiology may be related to abnormal synthesis and metabolism of androgens in the ovaries, impaired insulin secretion and activity, increased frequency of gonadotropin-releasing hormone, the presence of inflammation, and associated oxidative stress [1-5].

The most common hormonal changes observed in these women include elevated androgen and insulin levels, along with insulin resistance, decreased levels of follicle-stimulating hormone (FSH), and increased levels of luteinizing hormone (LH). Metabolic alterations, such as dyslipidemia, are also frequently present, typically manifesting as elevated triglyceride levels and reduced high-density lipoprotein (HDL) cholesterol levels [1-6]. These changes contribute to issues such as irregular menstrual cycles, seborrhea, acne, hirsutism, virilization, abdominal overweight, and obesity. Psychological disorders, such as depression or anxiety, are also commonly observed [1-5, 7-9].

Irregular menstrual cycles and anovulation often result in fertility issues. [4, 5]. Up to 73 out of every 100 women struggling with infertility are linked to PCOS [4].

Additionally, women with PCOS are at an increased risk of cardiovascular diseases and diabetes due to the hormonal and metabolic disturbances associated with the condition. These patients also have a higher likelihood of developing endometrial cancer [4, 5, 8].

According to the commonly used Rotterdam criteria, the diagnosis of PCOS requires the presence of at least two of the following criteria: 1) hyperandrogenism, 2) infrequent ovulation or anovulation, 3) polycystic ovaries on ultrasound [1-3]. Based on these three criteria, four PCOS phenotypes are distinguished. Phenotype A: the presence of hyperandrogenism, chronic anovulation, and polycystic ovaries have been identified (the most common phenotype); Phenotype B: the presence of hyperandrogenism and chronic anovulation; Phenotype C: the presence of hyperandrogenism and polycystic ovaries; and Phenotype D: the presence of chronic anovulation and polycystic ovaries [1, 10].

There is no cure-oriented treatment for polycystic ovary syndrome (PCOS). Therapeutic approaches depend on the individual needs of the patient and the predominant associated disorders and include treatments targeting issues such as: irregular menstrual cycles, anovulation, and hirsutism. Pharmacological treatments commonly include hormonal

medications, anti-androgens, and metformin. However, it is important to note that, in most cases, the first step in treating PCOS, before any pharmacotherapy, is lifestyle modification, primarily involving a proper diet and physical activity [2, 4, 6, 9].

In the following sections, we will discuss the role of these factors and their impact on PCOS.

DIET IN PCOS

As mentioned earlier, appropriate nutritional interventions play a crucial role in polycystic ovary syndrome. They are used both as a therapy and as a preventive approach. [11, 12]. Obesity is a common issue in PCOS, with up to 75 out of 100 women affected by the condition struggling with overweight or obesity [13]. Excessive fat accumulation is associated with hyperandrogenism [14]. It is important to remember that problems related to body weight, especially abdominal obesity, which is common among women with PCOS, contribute to an increased cardiovascular disease risk [13]. In patients with polycystic ovary syndrome, regardless of whether obesity is present, we often observe an abnormal lipid profile, such as higher LDL levels in the serum and lower HDL levels [14]. An estimated half of women with Stein-Leventhal Syndrome will develop disorders of glucose metabolism before reaching their fourth decade of life. This includes both prediabetes and diabetes. [15].

Considering that women with PCOS often face conception difficulties, it is also essential to highlight that lifestyle modification, including proper diet, can influence their prognosis in this area. This should be emphasized [16, 17]. Weight loss can significantly impact fertility function [18]. The appropriate nutrition for these patients should focus on optimizing metabolic mechanisms, enhancing impaired insulin sensitivity, and addressing fertility aspects [12].

It is essential for all women with polycystic ovary syndrome to follow a healthy diet [11]. Proper dietary modifications can significantly alleviate bothersome symptoms and positively influence metabolic improvement. A diet low in saturated and trans fats is particularly important [19]. These fats negatively affect problems with insulin sensitivity [18]. A diet rich in these fatty acids, combined with a caloric surplus, worsens the symptoms experienced by patients [12]. Proper fat metabolism, which can be disrupted by a high-fat diet, is essential for normal ovulation and, consequently, reproductive success [19]. On the other hand, beneficial

polyunsaturated fats found in a healthy diet reduce the likelihood of developing tissue resistance to insulin [18].

It has been observed that women with polycystic ovary syndrome consumed unhealthy fats in large amounts. At the same time, they did not monitor their caloric intake, exceeding their energy requirements. [11]. Compared to healthy individuals, these women often consume insufficient amounts of fruits, seeds, and vegetables, plant-based oils among other foods [20, 21]. This suggests that not adhering to a healthy diet has a negative impact on the development of symptomatic disease in these patients. [11].

There is no single, universally recommended diet that stands out as the most appropriate [13, 22, 23]. Diets such as those with a low glycemic index, very low-calorie, and ketogenic have been tested for effectiveness in women with PCOS, but there were no clear conclusions distinguishing one as superior to the others. [13, 22]. It is best for each woman to have a diet individually tailored to her symptoms and metabolic indicators [19].

In the following section, some of the most commonly used diets will be briefly described.

LOW- CALORIE DIET (LCD) AND VERY LOW-CALORIE DIET (VLCD)

A diet based on a low caloric intake entails the use of liquid meal replacements while ensuring the provision of essential nutrients. Typically, this diet involves up to 800 kcal per day. Despite the low-calorie intake, great attention is given to meeting the body's nutritional needs. [13]. This type of diet is characterized by effects such as the reduction of excess body fat and, as a result, often helps address the issue of insulin resistance. [19].

Very low-calorie diet positively affects lipid and glycemic profiles in women with PCOS. In addition to visible improvements, such as managing overweight and excess androgen levels, it also promotes favorable metabolic changes in the body. [13].

Due to the significant calorie reduction, potential substantial decrease in body weight, and other possible consequences, this diet should typically not last longer than 4 months. It is important to remember that regular medical oversight is also important. [13].

MEDITERRANEAN DIET

This diet is characterized mainly by the consumption of vegetables, fruits, nuts, olive oil, and whole grains. At the same time, the consumption of red meat is avoided. [18]. It also includes fatty fish rich in omega-3 fatty acids. It is high in fiber, antioxidants, and contains a variety of essential vitamins and minerals [12]. This way of eating is associated with the Mediterranean region, which has been historically linked to a lower prevalence of chronic diseases and longevity [11].

Adhering to this nutrition strategy has proven highly effective in preventing many lifestyle-related diseases. The Mediterranean diet is especially known for its anti-inflammatory and antioxidant properties [11]. In PCOS, the reduction of inflammatory processes in the body, due to the nutrients provided by this diet, may positively impact hyperandrogenism, insulin resistance, and lipid profiles [11,20]. The components of this diet support a healthy gut microbiome, which helps prevent the development of many metabolic disorders often associated with PCOS [12].

LOW-GLYCEMIC-INDEX (GI) DIET

The glycemic index (GI) of a food reflects how much and how quickly its carbohydrates raise blood glucose levels compared to a reference carbohydrate, typically white bread or glucose. The diet focuses on excluding high-GI foods [24].

It is believed that this type of diet helps restore the regularity of menstrual cycles and has a more significant impact on insulin sensitivity than traditionally healthy diets [19, 25].

This dietary method can significantly decrease the probability of developing common symptoms in women with PCOS, such as hyperandrogenism, acne, hirstyzm [15, 25]. The weight loss associated with this way of eating positively influences the fertility of these women. [15]. In terms of women's lipid profile, it contributes to improvements in total cholesterol, HDL cholesterol, and triglyceride levels [26].

KETOGENIC DIET (KD)

The ketogenic diet (KD) is a calorie-controlled eating plan that emphasizes high fat intake, moderate protein levels, and a very low carbohydrate (CHO) content, resulting in the formation of ketone bodies [11].

The main aim of the ketogenic diet, metabolic ketosis, happens when the body enters a state comparable to fasting. Research shows that following a ketogenic diet leads to significant reductions in body mass, insulin concentrations during fasting, the ratio between luteinizing and follicle-stimulating hormones and unbound testosterone It also influences the levels of androgens, lipids, and glucose [26]. These changes suggest that the ketogenic diet has beneficial effects on both physical composition and metabolic health in women with PCOS [11].

It is believed that for women with advanced obesity or metabolic disorders, the ketogenic diet may offer even greater benefits than a low-GI diet [26].

While ketogenic diets with low calorie intake are highly effective in reaching rapid metabolic goals, it is crucial to recognize that this needs to be a short-term solution [12].

While it seems to be beneficial, the condition we are discussing is chronic, demanding ongoing strategies. Therefore, when starting the diet, it is important to be aware of its temporary nature and the potential risks associated with prolonged use, such as disturbances in glucose levels and broader metabolic dysfunctions, including changes in lipid profiles, which may even lead to the onset of non-alcoholic fatty liver disease [11].

SUPPLEMENTATION

Supplementation with vitamins and minerals may be beneficial in alleviating symptoms associated with PCOS [27]. In the diet of women with PCOS, attention should be paid to minerals such as selenium, chromium, magnesium, calcium, zinc, carotenoids, and vitamins D and E [20]. Vitamin D supplementation may alleviate PCOS symptoms and positively affect ovarian function. It is suggested that lower chromium levels in women with PCOS are associated with insulin resistance, and chromium picolinate may potentially reduce clinical features of the disease such as hirsutism [18].

Omega-3 fatty acids, mentioned mainly in the context of the Mediterranean diet, reduce the risk of developing PCOS in women with impaired insulin response. [20].

PHYSICAL ACTIVITY IN PCOS

Physical activity is an essential element in the treatment of PCOS. The latest evidence underscores the significance of lifestyle changes—particularly through physical exercise and dietary habits [28,29]. These changes are pivotal in improving overall health, hormonal outcomes, and body weight management. They also improve metabolic outcomes thereby positively influencing various factors associated with PCOS [30]. In particular, weight loss has been shown to alleviate various symptoms of PCOS, emphasizing its fundamental role in the treatment of overweight or obese patients [26, 31].

IMPORTANCE OF LIFESTYLE MODIFICATIONS

Regular physical activity improves body composition, mental well-being, and cardiovascular fitness. Additionally, it enhances respiratory health and significantly increases insulin sensitivity [31, 32], which positively influences reproductive functions. It also plays a crucial role in improving the overall quality of life for women with this condition. International guidelines recommend lifestyle changes as the first step in the treatment of PCOS for every patient [21, 33].

PHYSICAL ACTIVITY RECOMMENDATIONS IN PCOS

Guidelines suggest a minimum of 2 hours and 30 minutes of moderate-intensity activity or 75 minutes of vigorous-intensity exercise per week. Additionally, it is recommended to incorporate muscle-strengthening activities at least twice a week while minimizing sedentary behavior. For those aiming for weight loss, the recommendation increases to 250 minutes of moderate activity or 150 minutes of vigorous exercise each week [34, 35]**.**

Research has shown that regular aerobic programs significantly improve insulin and lipid levels, facilitate weight control, and enhance overall physical and mental health [20,36].

EFFECTS OF EXERCISE ON HORMONAL PROFILES AND REPRODUCTIVE FUNCTION

Regular physical activity plays a crucial role in hormonal balance, particularly in regulating insulin and androgen levels.

Lifestyle interventions, including exercise, have been linked to the restoration of menstrual cycles and improved ovulation rates in women with PCOS [28, 33]. The mechanism underlying this improvement is primarily attributed to increased insulin sensitivity, which plays a significant role in regulating ovarian function. Physical training has been shown to significantly improve insulin resistance and body composition, both of which are critical for managing PCOS [36].

Furthermore, lifestyle changes can also contribute to better mental well-being by alleviating symptoms of anxiety and depression, especially among obese women with PCOS. These mental health benefits further emphasize the importance of a holistic approach to managing this complex disorder [37].

EFFECTS ON BODY COMPOSITION AND WEIGHT MANAGEMENT

Regular physical activity is crucial for weight management in women with PCOS. Even a modest weight loss of up to 10 percent can significantly improve hormonal profiles, menstrual regularity, and overall metabolic health. Resistance training, although less effective for weight loss, increases muscle mass, reduces abdominal fat, decreases waist circumference, and enhances metabolic outcomes. Regular exercise is also a key prognostic factor for long-term weight maintenance [31].

CONCLUSION

Polycystic ovary syndrome is a common condition, primarily seen in young women, that causes many bothersome symptoms. Obesity, hyperandrogenism, fertility issues and many metabolic and hormonal problems are common struggles for women, with an elevated risk of endometrial cancer being one of the most significant consequences. It is important to provide the best possible support for these patients.

Lifestyle interventions, particularly exercise and changes in eating habits, are the primary elements in the treatment of PCOS. Many women with this disease have unhealthy dietary habits. Modifications to the diet are essential; however, no specific diet is universally recommended. Instead, an individualized approach under the guidance of a specialist is crucial. The most effective lifestyle changes involve combining a personalized diet plan with appropriate physical activity tailored to individual needs

Educating patients about these critical lifestyle factors is paramount, as such interventions form the foundation for both short-term and long-term management of PCOS. Many patients believe that satisfactory results can only be achieved through pharmacotherapy, which leads to the underappreciation of the role of lifestyle modifications. Therefore, it is crucial for specialists to address this topic with patients and educate them.

Further research is needed to refine dietary and exercise recommendations and to investigate the impact of different physical activities and dietary habits on hormonal and metabolic parameters in women with PCOS.

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Author's contribution

Conceptualization: [NP], [WM], [AH]
Methodology: [NP], [WM], [NJ], [AŚ]
Software: [NP], [AK], [AH]
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Formal analysis: [JG], [AH], [AŚ], [KN]

Investigation: [NP], [WM], [AK], [AH]
Resources: [NJ], [AŚ], [JG], [WM]
Data curation: [NP], [WM], [AH]
Writing - rough preparation: [NP], [WM], [AH]
Writing - review and editing: [AŚ], [JG], [KN]
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