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NUTRITIONAL SUPPORT AND COMPLEMENTARY THERAPIES IN PCOS: CURRENT EVIDENCE AND FUTURE DIRECTIONS

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ABSTRACT

Polycystic Ovary Syndrome (PCOS) is a prevalent endocrine disorder that significantly impacts reproductive and metabolic health in women of reproductive age. Globally, the prevalence of PCOS varies widely, with estimates ranging from 5% to 20%, affecting approximately 116 million women worldwide. In India, the prevalence ranges from 3.7% to 26%, highlighting a notable increase due to factors such as urbanization, changing lifestyles, and dietary habits. This paper reviews the pathophysiology, clinical manifestations, and management strategies for PCOS, focusing particularly on nutritional interventions and complementary therapies. Evidence suggests that a combined approach involving dietary adjustments, micronutrient supplementation, exercise, and psychological support can yield significant improvements in insulin sensitivity, metabolic health, and quality of life for patients. Increased awareness and research into the multifaceted nature of PCOS remain essential for establishing effective management protocols that address not only the physical symptoms but also the psychological impacts of this syndrome, thereby aiding public health efforts to combat the rising prevalence of PCOS in both global and Indian contexts.

INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is a prevalent endocrine disorder that significantly impacts reproductive, metabolic, and psychological health among women of reproductive age. Its complex etiology involves insulin resistance, hyperandrogenism, and obesity, making the management of PCOS particularly challenging. Recent research has highlighted the potential role of nutritional support and complementary therapies as effective adjuncts in managing the diverse manifestations of PCOS.

The significance of dietary interventions in the management of PCOS cannot be understated. A comprehensive review highlighted that lifestyle modifications, specifically diet and physical activity, constitute the cornerstone of PCOS management, primarily focusing on weight loss and improvements in insulin sensitivity (Cowan et al., 2023). The Mediterranean diet, rich in omega-3 fatty acids and low in refined carbohydrates, has been associated with improved insulin resistance and metabolic profiles in PCOS patients (Barrea et al., 2019). In particular, n-3 polyunsaturated fatty acids (PUFAs) have demonstrated a beneficial role in lipid profiles and insulin sensitivity (Barrea et al., 2019; Onyegbule et al., 2022). A meta-analysis supports these findings, reporting consistent improvements in insulin resistance markers and lipid parameters among women adhering to dietary interventions that include n-3 PUFAs (Barrea et al., 2019).

NUTRITIONAL SUPPORT

Nutritional Interventions in PCOS Management

The role of nutritional interventions in managing PCOS is paramount, especially considering the association between dietary habits and insulin resistance, a key feature of this disorder. A systematic review indicates that dietary strategies, particularly those following the Mediterranean diet, can significantly affect insulin sensitivity and metabolic profiles in women with PCOS (Paris et al., 2020). The typical macronutrient distribution in the Mediterranean diet—high in carbohydrates (47%), moderate in proteins (14%), and healthy fats (39%)—has been found beneficial for managing PCOS reproductive traits (Paris et al., 2020). This highlights the importance of a balanced diet in alleviating the symptoms associated with PCOS.

Moreover, specific dietary approaches, such as low-glycemic index diets, are increasingly recommended due to their effectiveness in improving insulin sensitivity and promoting weight loss in overweight and obese women with PCOS (Deng et al., 2024). Evidence suggests that maintaining lower blood glucose levels through careful dietary choices can mitigate endocrine disruptions characteristic of PCOS (Rahman et al., 2023). A randomized controlled trial showed that participants adhering to a low-glycemic diet experienced reduced waist circumference and improved metabolic parameters compared to those on a standard diet (Deng et al., 2024).

Role of Supplements in PCOS

Nutritional supplementation also plays a crucial role in alleviating PCOS symptoms. Myo-inositol, for instance, has emerged as a potentially effective treatment for the metabolic and reproductive aspects of PCOS, particularly in those with insulin resistance (Rahmawati et al., 2021). It has been shown to improve ovulatory function and metabolic parameters in women with varying phenotypes of PCOS, highlighting its versatile application across different clinical profiles (Bevilacqua et al., 2018; Unfer et al., 2023). D-chiro-inositol, often administered alongside myo-inositol, enhances ovarian function and metabolic outcomes as

well (Bevilacqua et al., 2018). Numerous clinical trials have corroborated these findings, indicating that inositol can serve as a safer alternative to traditional pharmacological treatments (Rahmawati et al., 2021; Greff et al., 2023).

Supplementation with micronutrients has also gained attention as a supportive therapy for managing PCOS. Myo-inositol and D-chiro-inositol are two compounds frequently cited for their role in improving insulin sensitivity and supporting ovarian function in women with PCOS (Unfer et al., 2023). Clinical studies indicate that supplementation with these inositols leads to improved ovulatory function, menstrual regularity, and overall metabolic health (Rahmawati et al., 2021; Bevilacqua et al., 2018; Unfer et al., 2023).

Additionally, vitamin D supplementation is critical, especially as studies highlight its deficiency correlating with obesity and insulin resistance in PCOS patients (A et al., 2017; Kensara, 2018). Such interventions indicate the potential for using micronutrient supplementation as a means to enhance reproductive and metabolic outcomes in PCOS.

Vitamin D deficiency is also a significant concern for women with PCOS, with studies demonstrating the relationship between low vitamin D levels and metabolic disturbances in this population (A et al., 2017; Kensara, 2018). Supplementation with vitamin D has been associated with improvements in insulin sensitivity and reproductive outcomes, suggesting its potential as a beneficial adjunct therapy in managing PCOS (Wu & Lin, 2015; Miao et al., 2020). However, it should be noted that while current evidence suggests benefits, additional randomized controlled trials are required to establish definitive conclusions (Akhter et al., 2025).

Furthermore, probiotics have shown promise due to their ability to regulate gut microbiota, which can subsequently influence hormonal balance, particularly in relation to insulin sensitivity and inflammation (Rahman et al., 2023; Guevara et al., 2024). A systematic review found that probiotic and prebiotic interventions significantly improved metabolic markers in females diagnosed with PCOS, suggesting a mechanism through which gut health can interact with hormonal regulation (Guevara et al., 2024). This emphasizes the multifactorial nature of PCOS and the necessity of approaching its management from various angles, including dietary and gut health.

Moreover, the inclusion of probiotics as a therapeutic option is gaining traction due to their benefits in gut health, which may influence hormonal regulation and insulin sensitivity in PCOS patients (Khade et al., 2023; Calcaterra et al., 2023). Evidence suggests that specific strains of probiotics can enhance metabolic profiles and alleviate inflammatory markers associated with PCOS (Khade et al., 2023). Through modulation of the gut microbiome, probiotics may partially mitigate the chronic inflammation often seen in PCOS and contribute to improved metabolic outcomes (Mehta et al., 2018; Khade et al., 2023).

COMPLEMENTARY THERAPY:

Another noteworthy complementary therapy involves the use of antioxidants to counteract oxidative stress, a common feature in women with PCOS that exacerbates metabolic dysfunctions and cardiovascular risks (Żeber-Lubecka et al., 2023). Antioxidant supplementation, including compounds like alpha-lipoic acid, has shown promise in ameliorating oxidative stress markers, thereby improving insulin resistance and hormonal balance (Abu-Zaid et al., 2024; Panti et al., 2018). This intervention highlights the importance of addressing oxidative stress within the comprehensive management of PCOS.

Beyond nutritional support, incorporating physical activity into management strategies is essential for improving overall health in women with PCOS. High-Intensity Interval Training (HIIT) has demonstrated advantages in enhancing insulin sensitivity and hormonal profiles in overweight women diagnosed with PCOS (Hiam et al., 2019; Shele et al., 2020). Regular exercise not only assists in weight management but also contributes to reducing stress and improving psychological well-being, which are critical areas often affected by PCOS (Ou et al., 2023).

Yoga, specifically, has gained attention due to its holistic benefits, including reduction in anxiety and improvement in hormonal profiles (Devi & N, 2023). Regular practice of yoga has been shown to assist in balancing hormonal levels, thereby mitigating some of the symptoms of PCOS, such as irregular menstrual cycles and elevated androgen levels (Devi & N, 2023; Novaković et al., 2024). Integrating these physical activities into treatment regimens can have substantial positive effects on the quality of life and clinical outcomes for women with PCOS.

The benefits of lifestyle modification, along with nutritional therapies, are best realized when encompassed in a multidisciplinary approach. Current trends highlight the importance of integrating nutritional counseling, exercise programs, and psychological support in managing PCOS (Ou et al., 2023; Wolf et al., 2018). Such approaches facilitate comprehensive management strategies that address not only the metabolic and reproductive challenges but also the emotional well-being of women with PCOS, which is often overlooked in treatment paradigms (Wolf et al., 2018; Scannell et al., 2024).

Psychological and Emotional Considerations

The psychological impact of PCOS cannot be overlooked, as many women experience emotional distress due to body image issues, infertility, and hormonal imbalances. Studies demonstrate a significant connection between PCOS and various mental health disorders, including depression and anxiety (Memon et al., 2024; Zaman et al., 2023). Interventions aimed at enhancing psychological well-being, such as cognitive-behavioral therapy (CBT) and mindfulness training, have shown efficacy in improving mental health outcomes for women with PCOS (Wolf et al., 2018; Cochran et al., 2024). These psychological interventions not only support emotional resilience but can also positively influence behavioral changes related to diet and exercise adherence.

Holistic Approach: The Necessity of Multidisciplinary Care

Given the complex and multifaceted nature of PCOS, a multidisciplinary approach encompassing medical, nutritional, physical, and psychological management is increasingly being recognized as a best practice (Ou et al., 2023; Scannell et al., 2024). Future guidelines should advocate for the integration of dietary counseling, exercise programs, psychological support, and pharmacotherapy tailored to individual patient needs. Such comprehensive care can enhance not only physical health outcomes but also improve emotional and psychological well-being in women suffering from this disorder.

DISCUSSION

The management of Polycystic Ovary Syndrome (PCOS), a complex disorder involving insulin resistance, hyperandrogenism, and obesity, can be effectively supported by nutritional interventions and complementary therapies. The Mediterranean diet, rich in omega-3 fatty acids and low in refined carbohydrates, has shown positive effects on insulin sensitivity and metabolic health. Low-glycemic index diets also improve insulin resistance and promote weight loss, especially in overweight women. Supplements like Myo-inositol and D-chiro-inositol enhance ovarian function and insulin sensitivity, offering a safer alternative to traditional medications. Vitamin D supplementation addresses deficiencies linked to insulin resistance, while probiotics help regulate gut microbiota, influencing hormonal balance and improving metabolic markers. Complementary therapies, such as antioxidants (e.g., alpha-lipoic acid), reduce oxidative stress and improve insulin sensitivity, while physical activity, especially High-Intensity Interval Training (HIIT), enhances insulin sensitivity and hormonal profiles. A holistic approach combining these strategies is essential for effective PCOS management.

CONCLUSION

In conclusion, the management of PCOS must employ a comprehensive and individualized strategy that incorporates dietary modifications, nutritional supplementation, exercise, psychological therapies, and possibly pharmacological treatments. As research continues to elucidate the complex interrelations between diet, lifestyle, and the metabolic challenges associated with PCOS, future directions in clinical practice should emphasize a holistic approach that supports women's health across physical, emotional, and reproductive dimensions.

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