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Evaluating The Role Of Low Carbohydrate Diets In Polycystic Ovarian Disease Management

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Abstract:
Polycystic Ovarian Disease (PCOD) stands as the most prevalent hormonal condition impacting women in their reproductive age. It is primarily featured by elevated androgen levels, irregular ovulation, and the presence of metabolic syndrome. When it comes to addressing hormonal balance, weight control, and feelings of fullness in women with PCOD, a low-carbohydrate diet (LCD) may offer better favorable option compared to a traditional dietary approach. This comprehensive analysis aims to explain the influence of a low carbohydrate diet on PCOD, drawing from a variety of experiments and surveys conducted by esteemed researchers across the globe. Recent investigations have highlighted the pivotal role of insulin resistance in the regulation of PCOD, a factor that is also influenced by the adoption of a low carbohydrate intake. Notably, the impact of LCD on weight reduction, when compared to a standard diet, was modest but significantly remarkable. In the context of PCOD, limitations on calorie intake and the resulting weight loss seem to play a significant role in regulating factors such as ovulation rates, the likelihood of conception, glucose and insulin levels, insulin resistance, and hormones related to satiety. This suggests that the specific makeup of the diet takes a secondary role. It becomes clear that a low-carbohydrate diet (LCD) not only stands out for its impact on calorie control and weight loss but also extends its influence to encompass the complexities of managing PCOD.
Keywords: PCOD, Anovulation, Low-carbohydrate, insulin-resistance, weight-loss

1. INTRODUCTION

Effect of PCOD is very common and 4% to 12% of women in reproductive age undergone this syndrome. PCOD is primarily defined by three key features: hyperandrogenism, anovulation, and metabolic syndrome. Initially Stein and Eventual described this in 1935 [1] and after this a substantial advancements was seen in finding out its root causes, which span from neuroendocrine factors to the intricate interplay between obesity, insulin resistance (IR), and PCOD.

Hyperandrogenism caused by heightened enzymatic activity at the theca-interstitial cell level, while anovulation results from a disruption in the selection of a dominant follicle, leading to an excess of smaller follicles. PCOD is clinically categorized into three forms: classic PCOD, where all three primary features are present; non-classic PCOD; and asymptomatic PCOD, which is typically identified through ultrasonography. An increased ovarian volume or surface area (greater than 11ml or 5.5cm^2, respectively) is the specific ultrasound sign of PCOD.

For managing hyperandrogenism, cyproterone acetate remains a fundamental treatment. Anovulation and infertility are addressed through a consensus-based approach. Insulin-sensitizing treatments help to reduce hyperandrogenism, normalize menstrual cycle irregularities, and facilitate both spontaneous and induced pregnancies.

Given the current understanding of PCOD, it's vital for both patients and healthcare providers to adopt a comprehensive approach to its management. This strategy should encompass addressing typical issues like hirsutism and infertility while also taking into account the potential long-term risks linked to insulin resistance (IR). PCOD management may need adjustments over time as patients move through different life stages with changing goals

In contrast to these changing management needs, the significance of lifestyle modifications, particularly in terms of weight management and maintaining regular physical activity, should remain a consistent focus in the care of these patients. This is due to the enduring health implications of IR, which necessitate ongoing attention.

Despite PCOD's high prevalence, diagnosing and distinguishing it from other conditions can be intricate. This complexity stems, in part, from the lack of a specific diagnostic test for the disorder. Often, a blend of clinical history and a few laboratory tests is adequate to confirm the diagnosis and exclude other conditions with similar presentations. Both patients and healthcare providers must adopt a comprehensive approach to managing PCOD, informed by the current understanding of the condition. This approach should tackle familiar challenges such as hirsutism and infertility, while also considering the long-term risks linked to insulin resistance (IR). As patients progress through various life stages with different objectives, the management of PCOD may require adjustments accordingly.

However, PCOD involves addressing four main issues: regulating menstrual cycles, managing hirsutism, addressing fertility concerns, and managing the complications associated with IR, such as type 2 diabetes, dyslipidemia, and cardiovascular disease managing PCOD entails tackling four primary concerns: regulating menstrual cycles, addressing hirsutism, managing fertility issues, and dealing with complications related to insulin resistance (IR), such as type 2 diabetes, dyslipidemia, and cardiovascular disease. This review not only seeks to elucidate the diagnosis of PCOD and the management of its diverse symptoms but also emphasizes the significance of adopting a lifelong strategy to confront the challenges of IR in these frequently young patients.

2. **CLINICAL MANIFESTATION**:

   Menstrual Irregularities: PCOD frequently leads to irregular, infrequent, or even absent menstrual cycles. Some individuals may also endure heavy or prolonged menstrual bleeding.

Ovulation Dysfunction: Many individuals with PCOD encounter difficulties in ovulation; potentially resulting in infertility contrasting the evolving needs in managing PCOD (Polycystic Ovary Disorder), one aspect that should consistently receive attention is lifestyle adjustments, particularly in terms of weight control and maintaining regular physical activity. This focus remains crucial because of the enduring health consequences associated with insulin resistance (IR), which demands ongoing vigilances.

Despite the high prevalence of PCOD, diagnosing and distinguishing it from other conditions can be intricate. This complexity stems partly from the lack of a specific diagnostic test for the disorder. Often, a combination of clinical history and a few laboratory tests suffices to establish the diagnosis and eliminate other conditions with similar presentations. Once the diagnosis is confirmed, the available management

options might initially seem overwhelming, especially since the link between PCOD and IR has been established, rising questions about when and if insulin sensitizers should be utilized. However, by considering the specific concerns of both the patient and the healthcare provider at any given time, these options become more approachable.

Broadly, managing PCOD involves addressing four primary aspects: regulating menstrual cycles, managing excessive hair growth (hirsutism), addressing fertility concerns, and managing complications associated with IR, such as type 2 diabetes, abnormal lipid levels, and cardiovascular disease.

Weight Gain: PCOD is often linked to weight gain or obesity, although not all PCOD individuals are overweight. Metabolic Aberrations: PCOD can heighten the risk of metabolic issues, including high blood pressure, elevated cholesterol levels, and an increased susceptibility to cardiovascular disease.

Skin Concerns: In addition to acne, some PCOD sufferers may develop skin tags, skin darkening (acanthosis nigricans), or skin discoloration.

Mood Disorders: PCOD has been correlated with an increased likelihood of mood disorders, including depression and anxiety.

It is crucial to acknowledge that the manifestation of PCOD can vary significantly among individuals. While some may only experience a subset of these symptoms, others may encounter a multitude. Diagnosis and management of PCOD typically entail a combination of clinical assessment, hormone level measurements through blood tests, and imaging studies, usually employing ultrasound to evaluate the ovaries.

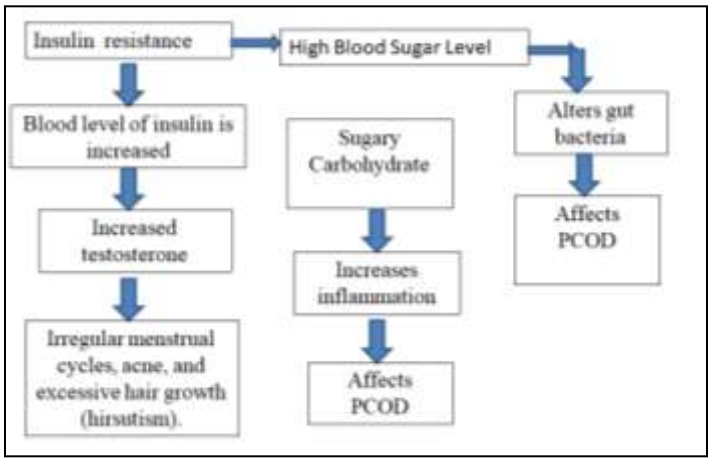

Fig 1-Effect of Carbohydrate on PCOD

The management of PCOD is individually tailored to target the particular symptoms of each person. It involves personalized approaches such as lifestyle adjustments (e.g., dietary changes and exercise routines), hormonal treatments (e.g., birth control pills), insulin-sensitizing medications, and other interventions designed to address specific symptoms and improve overall well-being. Collaborating closely with healthcare professionals is crucial for individuals with PCOD to develop a customized treatment plan that best suits their needs. PCOD in Adolescents-

The appearance of pubic hair before the age of 8, known as premature puberties, may serve as an early indicator of Polycystic Ovarian Disorder (PCOD) in adolescents. This condition is linked to ovarian hyperandrogenism and the onset of chronic anovulation. As physicians become more aware of PCOD, it is increasingly diagnosed at a younger age, facilitating early intervention and management.

PCOD, Seizure Disorders, and Valproic Acid - Patients with epilepsy often present a higher incidence of reproductive endocrine disorders, although the precise reasons remain debated. It likely involves a complex interplay of factors, including the impact of epilepsy on the hypothalamic-pituitary axis and the influence of antiepileptic drugs on hormone secretion. These effects can manifest directly or indirectly through alterations in weight and body composition. Valproic acid has attracted particular attention in this regard. Some evidence suggests that women using this medication may experience heightened levels of insulin, testosterone, and triglycerides compared to those using alternatives like lamotrigine. Nonetheless, it's worth noting that only a minority of them actually showed clear biochemical indications of PCOD.

DISCUSSION:

Most of the individuals with this issue exhibit insulin resistance (IR), with many of them being overweight or obese, which exacerbates this issue. It's not surprising, then, that a huge portion of PCOD patients show abnormalities in oral glucose tolerance tests when diagnosed. When considering both obese and lean PCOD patients together, a study by [2] Legro et al. in 1999 found that 31% had impaired glucose tolerance, and 7.5% met the criteria for type 2 diabetes mellitus. A similar study in the United States by Ehrmann et al [3] in 1999 confirmed these results. However, a European study by Ciampelli et al [4**]** in 1999 reported a lower prevalence of 6.4% impaired glucose tolerance and no cases of type 2 diabetes mellitus. This difference may be attributed to variations in the severity of obesity among the study populations.

In the United States, even non-obese PCOD patients exhibit a threefold higher prevalence of these disorders compared to the general population, with 10.3% showing impaired glucose tolerance and 1.5% diagnosed with type 2 diabetes mellitus [2]**.** Norman et al. found that among women with PCOD, 17% of those initially with normal glucose tolerance developed impaired glucose tolerance or type 2 diabetes mellitus over time, while 54% of those initially diagnosed with impaired glucose tolerance progressed to type 2 diabetes mellitus. This underscores the substantial risk of abnormal glucose tolerance in PCOD. Further supporting this, there's a tenfold increased risk of developing gestational diabetes mellitus in PCOD patients compared to the general population, which typically has a baseline risk of around 3%. Moreover, Cibula et al [5] observed a fourfold increased prevalence of type 2 diabetes mellitus in PCOD women who had undergone previous ovarian wedge resection for polycystic ovaries.

Due to the significant implications of abnormal glucose tolerance for the health of PCOD patients, extensive research has focused on the effects of insulin sensitizers in this regard. Metformin, in particular, has been extensively investigated and has demonstrated notable enhancement in insulin sensitivity in most uncontrolled studies Troglitazone has exhibited comparable effects in PCOD patients. Additionally, the continuous use of metformin throughout pregnancy in women with PCOD significantly reduces the incidence of gestational diabetes mellitus [6].

These findings suggest the potential of insulin sensitizers to delay or prevent the onset of type 2 diabetes mellitus in individuals with PCOD. The Diabetes Prevention Program provides insight into this, comparing the effects of metformin and lifestyle modifications against a placebo in obese patients with impaired glucose tolerance. Metformin reduced the risk of developing type 2 diabetes mellitus by 31% over 2.8 years compared to the placebo, while lifestyle changes were even more effective, reducing the risk by 58%. Notably, the lifestyle intervention was modestly involved, a 7% weight loss and just 20 minutes of brisk walking daily. However, the combined use of metformin and lifestyle changes was not assessed in the study [7].

In summary, when addressing the long-term health risks linked to PCOD, there should be a significant focus on lifestyle modifications. The findings from the Diabetes Prevention Program should be carefully communicated with all PCOD patients. If metformin is contemplated for preventing type 2 diabetes mellitus, uncertainties remain regarding its duration of use, given that the risk persists throughout life and its efficacy diminishes after cessation. Further investigation in this realm is warranted regarding PCOD treatments.

Anti-androgen medications work by inhibiting the actions of androgens, which can alleviate symptoms such as scalp hair loss, excessive facial and body hair growth, and acne. However, it's essential to

recognize that these drugs lack approval from the Food and Drug Administration (FDA) for treating PCOD symptoms and may carry pregnancy-related risks.

Metformin-Metformin is commonly prescribed for the management of type 2 diabetes and may offer some relief for certain PCOD symptoms. Like anti-androgen medications, metformin is not FDA-approved specifically for PCOD treatment. Metformin works by improving insulin's ability to lower blood sugar levels and can consequently reduce both insulin and androgen levels. After several months of use, metformin may help restore ovulation, but its impact on acne and excess facial or body hair is generally limited. Recent research suggests that metformin may also have other beneficial effects, such as reducing body weight and improving cholesterol levels [8].

Thiazolidinediones- Troglitazone, a medication belonging to the thiazolidinedione class, has shown promising results in the context of PCOD. When used alone, troglitazone achieved ovulation rates exceeding 40%. Moreover, in cases of clomiphene resistance, pretreatment with troglitazone significantly increased the success rate of clomiphene therapy from 35% to 75%. Troglitazone use in clomiphene-resistant patients resulted in high ovulation and pregnancy rates, reaching 83% and 39%, respectively. [9,10].

Lifestyle Modification and Weight Loss

Weight loss is a fundamental aspect of managing PCOD. However, achieving and sustaining weight loss can be challenging, as demonstrated by the considerable number of overweight and obese individuals. There is some evidence to suggest that a low-carbohydrate diet may have potential benefits for women with PCOD, particularly in terms of weight management, insulin sensitivity, and hormonal balance. However, the suitability of such a diet should be assessed on an individual basis, and it's crucial to prioritize a balanced and sustainable approach to nutrition and lifestyle management in PCOD. : While low-carbohydrate diets may offer benefits for some women with PCOD, it's essential to approach them with caution. Such diets can be restrictive and may not be suitable for everyone. A balanced diet that meets individual nutritional needs is crucial. Consulting a healthcare provider or registered dietitian preferred to develop a personalized dietary plan that considers overall health and PCOD management. The authors extend their heartfelt appreciation for the steadfast support provided by the authorities of Swami Vivekananda University throughout the course of the research project.

CONCLUSION:

If we believe in science, we must not panic. If there is will there is definitely some scientific way to get rid of PCOD. Managing PCOD in women depends on two primary factors: controlling energy intake and achieving weight reduction. Interestingly, a low-carbohydrate diet has an unexpectedly scientific impact

on weight loss compared to a standard diet when caloric intake is restricted. Even a brief period of energy restriction, lasting from 2 to 6 weeks, can result in enhancements in ovulation rates, fertility, testosterone levels, insulin levels, and insulin sensitivity. Although this article does not extensively discuss the method for sustainable weight loss there are several crucial points worth highlighting. Elevated physical activity and dietary adjustments represent fundamental cornerstones for achieving successful weight loss and mitigating cardiovascular risk when detected early and managed effectively with lifestyle modifications, which may include insulin-sensitizing medications, and dietary changes, there is a chance to postpone or even prevent the onset of type 2 diabetes mellitus and the accompanying risk of coronary artery disease. Our aspiration is that this review will enhance the understanding of healthcare professionals across diverse fields and provide valuable insights for the skilled management of these complex cases.

Future scope:

Research on the relationship between low carbohydrate diets and polycystic ovarian disease (PCOD) is an key area of study that affected many women in nutshell. In summary, future research on the relationship between low carbohydrate diets and PCOD should aim to provide more comprehensive and nuanced insights into the benefits, potential risks, and optimal dietary strategies for managing this common and complex condition. Collaborative efforts among researchers, healthcare providers, and individuals with PCOD will be crucial in advancing our understanding of this topic.

Conflict of Interest: The authors affirm that they have no conflicts of interest to disclose

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