

Effect of Intermittent Fasting in Polycystic Ovary Syndrome: A Narrative Review

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Abstract:

Background: Polycystic Ovarian Syndrome (PCOS) is a heterogeneous disorder characterized by chronic hyperandrogenism, anovulation, weight gain, and insulin resistance. Approximately 3.4% of women globally, equivalent to about 116 million individuals, are estimated to be affected by PCOS. Intermittent fasting (IF) is a potential dietary intervention that includes various regimens, such as time-restricted fasting. **Aim:** The aim of this review article is to explain the complex relationship between polycystic ovarian syndrome and metabolic manifestations, including hyperandrogenism, insulin resistance, obesity, and cardiac dysfunction, and how intermittent fasting helps in treating this syndrome. **Method:** The method involves an extensive literature search and the extraction of information from various sources. Screening was performed for titles and abstracts, and potentially eligible citations were retrieved by the authors. **Results:** Intermittent fasting is discussed as a potential approach to improving conditions associated with polycystic ovary syndrome. Various effects of intermittent fasting on polycystic ovarian syndrome are mentioned, such as control of blood glucose levels, reduction of hyperandrogenemia, positive effects on menstrual flow, weight control, and improvement of body composition. Intermittent fasting is reported to reduce insulin resistance and cardiac hypertrophy. **Conclusion:** More research is required to confirm and establish intermittent fasting as a recommended treatment for polycystic ovarian syndrome. The absence of studies on the impact of intermittent fasting on the metabolic syndrome of polycystic ovarian syndrome patients is highlighted, indicating the need for further research.

Keywords: Polycystic ovarian syndrome, Intermittent fasting, Obesity, Cardiac dysfunction, Insulin resistance, Hyperandrogenism

1. Introduction:

PCOS is a complex disorder characterized by chronic hyperandrogenism and anovulation that is frequently associated with weight gain and insulin resistance [1]. The three most prevalent symptoms of

PCOS are infertility, amenorrhea, and excessive body hair [2]. PCOS is linked to some conditions, including endometrial cancer, depression, obstructive sleep apnea, obesity, metabolic syndrome, impaired glucose tolerance, type 2 diabetes mellitus, cardiovascular risk, and non-alcoholic fatty liver disease or non-alcoholic steatohepatitis. Currently, four distinct phenotypes of polycystic ovarian syndrome (PCOS) have been identified.

- Type A includes polycystic ovaries, chronic anovulation, and hyperandrogenism.
- Type B includes both chronic anovulation and hyperandrogenism.
- Type C includes both polycystic ovaries and hyperandrogenism.
- Type D includes both polycystic ovaries and chronic anovulation.

PCOS women are reported to have an increased risk of cardiovascular disease due to phenotypes, insulin resistance, hyperinsulinemia, and overexposure to androgens. Among the percentage of women with PCOS, 50–80% are obese, 30–35% have impaired glucose tolerance, and 8–10% are determined to be diabetic or have a family history of diabetes [3]. Globally, 3.4% of women, or about 116 million, are estimated to be affected by PCOS, according to data from the World Health Organization[4].

Intermittent fasting (IF) is a dietary approach that involves either a prolonged fast during the night or calorie restriction on one or more days each week [5]. Various fasting methods can be used, such as alternate-day fasting, time-restricted eating, whole-day fasting, and modified fasting techniques [6]. It also causes a long-term "metabolic adaptation" as a unique type of calorie restriction, which might lower the metabolic rate and increase human lifetime [7]. There is no review of the impact of intermittent fasting on PCOS patients. As a result, this review article was prepared.

2. Methods:

The method involves an extensive literature search and the extraction of information from various sources. Screening was performed for titles and abstracts, and potentially eligible citations were retrieved by the authors.

3. Conditions associated with Polycystic Ovarian Syndrome:

PCOS is associated with many conditions, such as obesity, insulin resistance (IR), and hyperandrogenism [8]

3.1. Correlation between Polycystic Ovarian Syndrome and Hyperandrogenism:

Hyperandrogenism is a state with an excess production of "male" hormones, although these hormones are normally found in women at lower levels. The most clinically relevant hormone in hyperandrogenism is testosterone, which is converted peripherally to dihydrotestosterone (DHT), its biologically active form. The most common symptom of hyperandrogenism in women is hirsutism, and the most prevalent cause is polycystic ovarian syndrome [9]. Hyperandrogenism can be identified by total testosterone levels that are higher than 55 ng/dl (1.7 mmol/l) [10]. Increased testosterone production is linked to islets of Langerhans dysfunction, which compromises the pancreatic metabolic processes and results in hyperinsulinemia [3]. Androgen hyper-activation leads to ovulation disorder, menstrual disorder, hirsutism, and acne, suggesting that hyperandrogenism is not only a clinical characteristic of PCOS but also an important risk factor [11].

3.2. Impact of PCOS on Insulin Resistance:

Insulin resistance is the decreased physiological response of target tissues to insulin stimulation [12]. Insulin resistance affects around 75% of people with PCOS [13]. Patients with PCOS who are obese or overweight were found to secrete more insulin, followed by excessive proinsulin levels, which resulted in the development of insulin resistance and hyperinsulinemia. Obese and overweight PCOS women are more likely to experience problems with glucose metabolism [3]. One of the key elements in avoiding metabolic and hormonal problems is the early detection and therapy of insulin resistance in women with PCOS. Increased androgen synthesis and decreased sex hormone-binding globulin due to hyperinsulinemia lead to an excess of free androgens. Most of the clinical symptoms of PCOS, including hirsutism, acne, and ovulatory dysfunction, are caused by an elevated amount of free androgen [14].

3.3. Association Between Polycystic Ovarian Syndrome and Obesity:

Obesity affects the majority of women with PCOS, placing them at increased risk for impaired glucose tolerance, metabolic abnormalities, and type 2 diabetes, and possibly for cardiovascular and cerebrovascular events and venous thromboembolism [15]. PCOS has a complex pathogenesis that is still not fully understood. However, a strong link has been found between obesity and PCOS development, with more than 50% of PCOS patients being obese or overweight [16].

A higher body mass index (BMI) value, resulting in overweight or obesity, is present in about 80% of women with PCOS [17]. Obesity raises the risk of hyperandrogenism, hirsutism, infertility, and pregnancy complications both directly and indirectly through the aggravation of PCOS. Obesity exacerbates the metabolic and reproductive symptoms of PCOS and worsens insulin resistance. Improvements in insulin resistance, reproductive health, and metabolic characteristics result from the treatment of obesity through lifestyle intervention [18].

3.4. Relationship between polycystic ovarian syndrome and cardiac dysfunction:

Cardiovascular disease affects premenopausal women much less frequently than it does men. In premenopausal women, estrogen is responsible for about 30% of the cardiovascular benefit [19]. The imbalance of this estrogen is seen in PCOS patients, and it increases the risk of cardiovascular disease in this condition.

4. Effect of Intermittent Fasting on Conditions Associated with PCOS:

Intermittent fasting regimens may be a promising approach to losing weight and improving metabolic health for people who can safely tolerate intervals of abstaining from food or eating sparingly for certain hours of the day, night, or days of the week.

Intermittent fasting regimens are hypothesized to influence metabolic regulation via effects on (a) circadian biology, (b) the gut microbiome, and (c) modifiable lifestyle behaviors, such as sleep [20].

4.1. Outcome of Intermittent Fasting on Hyperandrogenism:

One of the main characteristics of PCOS is hyperandrogenemia, which frequently causes irregular menstruation. Fasting for 12–20 hours is generally referred to as time-restricted feeding (TRF). The article “Eight-hour time-restricted feeding improves endocrine and metabolic profiles in women with anovulatory

polycystic ovary syndrome” investigated the effects of TRF on menstruation, gonadal, and metabolic parameters in women with anovulatory PCOS in a 6-week trial with 2 consecutive periods:

- (a) 1-week baseline weight stabilization period; and
- (b) a 5-week TRF period.

And they concluded that more than half of the patients were able to resume their regular menstrual cycle after TRF. It is thus encouraging that TRF can reduce hyperandrogenemia by raising the level of sex hormone-binding globulin and have positive effects on re-establishing regular menstrual flow in PCOS patients. Recent research has indicated that TRF may be helpful for weight loss, insulin resistance improvement, metabolism regulation, and cardiometabolic health [21].

4.2. Consequence of Intermittent Fasting on Glycaemic Control:

Controlling blood glucose is the main objective of type 2 diabetes treatment. For those who are obese, losing weight is typically advised to increase insulin sensitivity. There have been reports of diverse responses, though. Another significant finding is that time-restricted feeding appears to improve insulin sensitivity. Furthermore, when it comes to controlling blood sugar levels, intermittent energy restriction may be superior to ongoing dieting [22].

4.3. The Possible Benefits of Intermittent Fasting on Obesity:

Meta-analyses have also shown that time-restricted feeding (TRF) is more likely to control weight and improve body composition. In active women, exercise combined with TRF can result in a greater loss of fat mass than exercise with a normal diet, and the TRF-following people reported an 18% decrease in visceral fat mass [21]. A 6-week program of 8 hours of TRF provided significant improvements in anthropometric, hormonal, and metabolic (especially insulin-glucose and lipid) profiles in women with PCOS. TRF therapy appears to be a suitable intermittent fasting protocol that can be used as a treatment of choice for PCOS [23].

4.4. Effect of Intermittent Fasting on Cardiac Functions:

The positive effect of the diet has been observed in preventing high blood pressure. The intermittent fasting diet leads to an increase in brain-derived neurotrophic factor, which leads to a decrease in systolic and diastolic blood pressure through activation of the parasympathetic nervous system. Brain-derived neurotrophic factor causes acetylcholine to be released by the vagus nerve, which reduces the frequency of heart contractions. Therefore, the intermittent fasting diet helps to reduce cardiac hypertrophy [24].

5. Discussion:

The complex relationship between metabolic manifestations and polycystic ovarian syndrome (PCOS) is highlighted in this thorough review, which also discusses the effects of obesity, insulin resistance, hyperandrogenism, and heart failure. According to the study, acne, hirsutism, and irregular menstruation are all clinical symptoms of PCOS, which is largely caused by elevated testosterone levels. Further highlighting hyperandrogenism as a critical risk factor for PCOS in addition to its role as a clinical feature

is the correlation between elevated testosterone production and islets of Langerhans dysfunction resulting in hyperinsulinemia.

A significant majority of people with PCOS experience insulin resistance, which manifests as a pervasive metabolic disturbance. The paper outlines the connection between obesity, insulin resistance, and PCOS and emphasizes the value of early diagnosis and treatment. A series of metabolic and hormonal abnormalities are revealed by the interaction of insulin resistance with elevated androgen synthesis and decreased sex hormone-binding globulin, which leads to the clinical symptoms of PCOS. The need for comprehensive management strategies is highlighted by the realization of these complex relationships.

Over 50% of PCOS patients are obese or overweight, highlighting the significant correlation between obesity and the disease. The manuscript describes how obesity aggravates symptoms related to metabolism and reproduction, including insulin resistance and an increased risk of hyperandrogenism. It has been determined that obesity-focused lifestyle interventions are useful for enhancing insulin resistance, reproductive health, and metabolic traits in Pcos. This knowledge serves as a foundation for creating tailored interventions with a weight management focus. While acknowledging that people with PCOS have a higher risk of cardiovascular disease, the study also highlights the importance of hormonal imbalances, specifically the lower levels of estrogen that protect the cardiovascular system in premenopausal women. The management of PCOS is now approached holistically, taking into account cardiovascular and reproductive health.

Weight loss, insulin resistance, metabolism regulation, and cardiometabolic health are all positively impacted by intermittent fasting, which is presented in the manuscript as a possible therapeutic strategy for PCOS. Results on menstrual regularity, metabolic parameters, and hyperandrogenism in PCOS patients are encouraging when it comes to time-restricted feeding (TRF). To substantiate intermittent fasting as a suggested treatment for PCOS, the study rightly suggests more research.

6. Conclusion:

Polycystic ovarian syndrome (PCOS) causes a host of metabolic problems, including insulin resistance, obesity, hyperandrogenism, and cardiac dysfunction. An effective dietary approach for Pcos-related metabolic problems is intermittent fasting, which also lowers insulin resistance. More research is needed to confirm the benefits of intermittent fasting and to recommend it as a treatment for PCOS, even though it is helping with the condition.

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