

POLYCYSTIC OVARY SYNDROME: ADVANCEMENTS IN UNDERSTANDING AND MANAGING THE CONDITION

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Abstract: According to the World Health Organization (WHO) polycystic ovary syndrome (PCOS) occurs in 4–8% of women worldwide and its prevalence in Indian adolescents is 12.2%. The exact cause of PCOS is unknown. The disease is multifactorial and complex and, therefore, often difficult to diagnose due to overlapping symptoms. Different diagnostic criteria have been adopted for the determination of PCOS in a patient, including hyperandrogenism, dysfunctional ovaries, and polycystic ovaries morphology (PCOM) and its combination. The symptoms of PCOS vary and the common factors that might play a role include, insulin resistance, low-grade inflammation, heredity, excess androgen. Lifestyle change is the first line of treatment for the management of women with PCOS. A healthy diet with adequate exercise will help to alleviate the symptoms of PCOS.

Keywords: PCOS management, Hormonal changes, Lifestyle modifications

Introduction

PCOS, or polycystic ovarian syndrome, is a prevalent hormonal disorder affecting women of reproductive age. Though the onset commonly occurs in adolescence, the symptoms could change over time. Hormonal abnormalities, irregular periods, high testosterone levels, and ovarian cysts can all be symptoms of PCOS. It has been found that estimated 8–13% of women who are of reproductive age have the illness, and up to 70% of cases go untreated, this presents a severe public health hazard [1].

PCOS is a lifelong condition involving multiple endocrine, cardiometabolic, ovulatory, and reproductive abnormalities. In adults, diagnosis typically requires the presence of chronic anovulation, hyperandrogenism, and either polycystic ovarian morphology or elevated anti-Müllerian hormone levels. Genetic predisposition, lifestyle factors, and obesity contribute to

the underlying endocrine disturbances in PCOS, which include insulin resistance, hyperandrogenism, and alterations in neuroendocrine function [2].

A fully effective and consistent treatment for PCOS has yet to be established. However, dietary interventions can help alleviate symptoms and improve long-term outcomes. In particular, weight management and reduction of abdominal fat have been shown to be highly beneficial in managing the condition [3].

This review highlights the key risk factors and outlines effective management strategies aimed at reducing the severity of PCOS or preventing its onset.

Hormonal changes associated with PCOS

PCOS patients are reported to have changes in a number of hormones, including gonadotrophin releasing hormone, the luteinising hormone/follicle stimulating hormone (LH/FSH) ratio, estrogens, androgens, insulin, cortisol, growth hormone (GH), vitamin D, and parathyroid hormone. An important contributing factor to the development of PCOS is hyperinsulinemia linked to insulin resistance. Insulin resistance may rise as a result of elevated testosterone levels brought on by hyperinsulinemia. PCOS women are more likely to have diabetes and obesity due to pathological alterations in these hormones, including increased insulin, decreased GH, increased ghrelin, and leptin resistance. PCOS is associated with infertility and is characterized by low estrogen, elevated LEAP-2, elevated LH basal, elevated LH/FSH ratio, elevated androgens, and decreased GH [4].

Major risk factors

a. Genetics

PCOS is a complex and highly heterogeneous disorder. Although the genetic foundation of PCOS varies from family to family and between families, it is linked to a shared route. Numerous anomalies contribute to PCOS, which is a complex condition. PCOS is linked to all genes or mutations that have an indirect or direct impact on the ovaries. To date, no true penetrance of a single gene mutation has been discovered, despite numerous investigations being carried out in different families to identify the underlying gene or mutation [5].

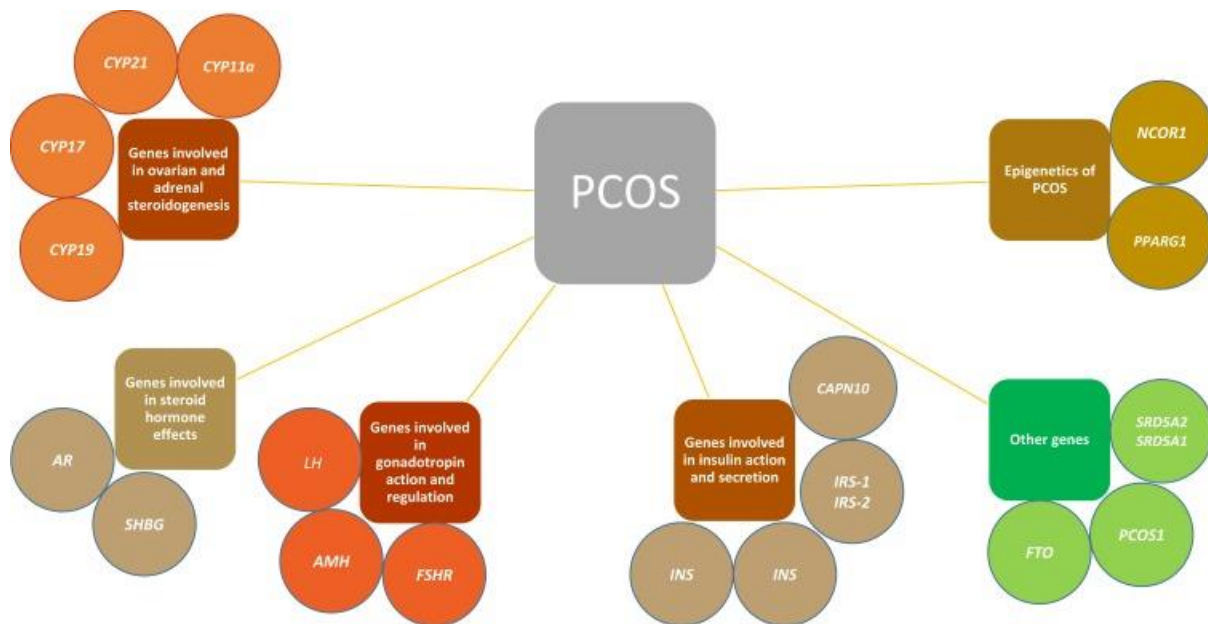


Fig 1: Summary of the genes involved in PCOS highlights the complexity of the disease [6]

b. Diet

Although many PCOS slim patients also have PCOS, the condition is primarily associated with obese women. It has been discovered that diet has a role in PCOS. Dietary proteins and fats can react with blood sugar to produce advanced glycation end products (AGEs). These substances have been connected to diabetes and cardiovascular disease since they are known to enhance inflammation and stress in the body [7].

A study conducted to summarize the effectiveness of the mediterranean diet, ketogenic diet, lactose-free diet and supplementation in reducing PCOS symptoms found that the Mediterranean diet is the most beneficial dietary strategy since it lowers the risk of various conditions like osteoarthritis, diabetes, and hypertension. A lactose-free diet turns out to be the least successful intervention [8].

c. Environmental factors

PCOS and other reproductive health problems in women can result from environmental exposure to endocrine-disrupting substances. It may be most dangerous during pregnancy and the first few months after delivery, when organ systems are still growing, according to research. Multicenter, hospital-based case–control study found that environmental exposure to a PFAS mixture was associated with an elevated odds of PCOS [9].

d. Lifestyle modification

A study conducted by Pramukawati, et al., (2024) found that Obesity, smoking, irregular periods, and a family history of PCOS increase the risk of PCOS in women of childbearing

age. In addition to conventional medical therapies, tailored lifestyle changes ought to be a key component of PCOS management. One promising therapeutic strategy for the treatment of obese PCOS patients is lifestyle modification combined with combination therapy. Since obesity is well known to exacerbate PCOS, it is advised to maintain a healthy weight, particularly with regard to belly circumference [11].

Signs of PCOS

The common dermatological features include, Hirsutism, balding, oily skin, acanthosis nigricans, and acne. Many dermatological complaints are usually caused by high androgen levels. These include acne, balding/alopecia, and hirsutism. Some of the symptoms associated with dermatology in teenagers may not be related to PCOS, but rather to puberty [12].

Menstrual disorders

Menorrhagia, Amenorrhea, and Oligomenorrhea. Menstrual abnormalities can range from profuse bleeding (menorrhagia) to complete lack of menstruation (amenorrhea), or menstruation delayed for 35 days or longer (oligomenorrhea). Ninety-one percent of women who experience irregular menstrual cycles will develop PCOS. Infertility reports are 15 times higher among those with PCOS [13].

Polycystic Ovaries

larger ovary and more follicles than usual. PCOS may be associated with excessive follicles, which are characterized as 25 or more follicles measuring 2 mm to 10 mm in a single transvaginal ultrasound image. There may also be an ovary larger than 10 mL, or increased ovarian volume.

Nutritional management

Low-glycemic diets are preferred for treating the condition. [14][15]. A low glycemic index diet has also been linked to a lower incidence of endometrial, breast, and ovarian cancers, as well as a lower risk of type 2 diabetes, metabolic syndrome, insulin resistance, and cardiovascular disease [16]. Consuming foods high in unsaturated fats lowers the risk of chronic diseases, but diets heavy in fat, particularly saturated fat and trans-fatty acids, primarily impair insulin sensitivity and raise the risk of type 2 diabetes, metabolic syndrome, and cardiovascular disease [17][18]. Research findings indicate that vitamin D is involved in multiple metabolic processes, such as insulin metabolism, and that insufficient vitamin D contributes to the development of insulin resistance and polycystic ovary syndrome (PCOS) [19].

Women with high testosterone or insulin resistant conditions, such as type 2 diabetes and metabolic syndrome, have been found to have lower magnesium levels. As a result, magnesium supplementation appears to be useful in modifying and improving insulin resistance. Caffeine alters hormone levels and impacts ovulation and corpus luteum function. The majority of research has shown that caffeine consumption increases the chance of reduced fertility. It has been found that consuming more than 500 mg of caffeine daily raises the chance of becoming infertile [20].

Medications

There are several medications available to address various PCOS symptoms. Regular periods can be caused with the contraceptive pill, or they can be induced with an intermittent course of progestogen tablets, which are typically taken every three to four months. This measure will moreover mitigate the enduring danger of endometrial malignancy, a disease linked to irregular menstruation. For PCOS women who are attempting to conceive, clomifene may be the first prescribed medication. Monthly release of an egg from the ovaries is encouraged by clomifene (ovulation).

Surgery

For PCOS-related reproductive issues that do not improve with medication, laparoscopic ovarian drilling (LOD) is a minimally invasive surgical technique that may be a therapy option [21].

Conclusion

Changing lifestyle patterns play a significant role in the increasing prevalence of Polycystic Ovary Syndrome (PCOS). Once diagnosed, timely and effective management is crucial, as the condition is associated with a range of complications that can significantly impair quality of life. Dietary habits, physical activity, and coexisting medical conditions collectively influence the severity and outcomes of PCOS. Therefore, a holistic approach to lifestyle modification remains central to managing symptoms and improving long-term health in affected individuals.

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