

Polycystic Ovarian Syndrome

What is polycystic ovarian syndrome?

Polycystic ovarian syndrome (PCOS) is one of the leading causes of **infertility**, affecting 6-8% of women worldwide of childbearing age. Although the underlying cause is not well understood, PCOS is generally characterized by numerous fluid-filled sacs (**cysts**) on the ovaries, an excess production of **androgens**, absence of (**amenorrhea**) or prolonged menstrual periods (menometrorrhagia), absence of ovulation (ovaries do not release eggs (**anovulation**)), excess hair growth, obesity, and a varying degree of **insulin resistance**.

Androgens are normally produced in small amounts by a woman's ovaries and **adrenal glands**. Even a slight overproduction of male hormones, such as testosterone, can lead to symptoms such as **hirsutism**, acne, and in extreme cases, **virilization**.

Normal menstruation is regulated by **hormones** released by the **pituitary gland** and the ovaries. In PCOS, the pituitary releases increased levels of leuteinizing hormone (LH) and the ovaries produce greater amounts of androgens. These hormonal imbalances affect the monthly menstrual cycle, resulting in irregular periods. Thus, egg release is sporadic or even absent, often resulting in infertility problems.

With PCOS, both ovaries tend to be enlarged, as much as three times their normal size. In as many as 90% of women with PCOS, an ultrasound of the ovaries will reveal cysts, small immature egg-bearing follicles, fluid-filled follicles, that can be seen on the surface of the ovary. These ovarian cysts are often lined up to form the appearance of a "pearl necklace."

When an egg is not released and a woman is not menstruating, sufficient progesterone is not produced. Insufficient progesterone causes a hormonal imbalance in which estrogen goes "unopposed." This imbalance can lead to an overgrowth of the lining of the uterus (endometrial **hyperplasia**) and can increase a woman's risk of developing endometrial cancer. Women with PCOS who do ovulate and become pregnant tend to have an increased risk of miscarriage.

Although the cause of PCOS is not well understood, some think that insulin resistance may be a key factor. Insulin is vital for the transportation and storage of glucose at the cellular level; it helps regulate **blood glucose levels** and has a role in carbohydrate and lipid metabolism. When there is resistance to insulin's use at the cellular level, the body tries to compensate by making even more insulin in the blood (hyperinsulinemia). Some believe that hyperinsulinemia may be at least one cause for increased production of androgens by the ovaries.

Most women with PCOS have varying degrees of insulin resistance, obesity, and abnormal **blood lipid levels**. However, insulin resistance tends to be even more pronounced in those who are obese and do not ovulate. These conditions put those with PCOS at a higher risk of developing **type 2 diabetes**, **hypertension**, and **cardiovascular disease**.

Signs and Symptoms

Women who have PCOS may experience a wide variety of symptoms to a greater or lesser degree, which may vary over time. A uniform and precise definition of the syndrome is lacking, though in general, women who have menstrual irregularities, experience **infertility**, have symptoms associated with androgen excess, polycystic ovaries, and have had other disorders ruled out (**Cushing syndrome**, **acromegaly**, **hypothyroidism**) are considered to have PCOS. They may experience:

- Abnormal uterine bleeding (menometrorrhagia) or **amenorrhea**/dysmenorrhea (60-75% of PCOS cases)
- Ovaries with multiple **cysts** (polycystic) (75-90% of PCOS cases)
- Increased hair growth (**hirsutism**) and acne (65-75% of PCOS cases)
- Obesity - fat distribution in center of the body (40-50% of PCOS cases)
- Hormone imbalance (50-70% of PCOS cases)
- Various skin conditions - **acanthosis nigricans** and skin tags in the armpits or neck
- Decreased breast size
- Deeper voice (rare)
- Enlarged ovaries
- Thinning hair, with male pattern baldness
- Sleep **apnea**

Tests

PCOS is a diagnosis of inclusion and exclusion. There is not a specific test that can be used to diagnose PCOS and there is not widespread agreement on what the diagnostic criteria should be. A woman's doctor will do tests to rule out other causes of **anovulation** and **infertility**. He will usually order a variety of hormone tests to help determine whether the symptoms are due to hormone overproduction as seen in PCOS, an **adrenal** or ovarian tumor, or an overgrowth in adrenal tissue (adrenal **hyperplasia**). Ultrasounds are often used to look for **cysts** in the ovaries and to see if the internal structures appear normal.

A doctor will evaluate a combination of laboratory results and clinical findings that suggest PCOS. If a woman is diagnosed with PCOS, her doctor may order tests such as **lipid profiles** and **glucose levels** to evaluate and monitor the risk of developing future complications such as **diabetes** and **cardiovascular disease**.

Laboratory Tests

- **FSH** (Follicle Stimulating Hormone) - will be normal or low with PCOS
- **LH** (Lutenizing Hormone) - will be elevated
- **LH/FSH ratio** - This ratio is normally about 1:1 in premenopausal women, but with PCOS a ratio of greater than 2:1 or 3:1 may be considered diagnostic.
- **Prolactin** - will be normal or low (elevated in hyperprolactinemia)
- **Testosterone** - total and/or free; usually elevated
- **DHEAS** - frequently mildly elevated with PCOS; may be done to rule out a virilizing adrenal tumor in women with rapidly advancing **hirsutism**
- **Estrogens** - may be normal or elevated
- **Sex hormone binding globulin (SBGH)** - may be reduced
- **Androstenedione** - may be elevated
- **hCG** (Human chorionic gonadotropin) - used to check for pregnancy; negative unless pregnant
- **Lipid profile** (low **HDL**, high **LDL**, and **cholesterol**, elevated **triglycerides**)
- **Glucose** - fasting and/or a glucose tolerance test; may be elevated
- **Insulin** - often elevated
- **TSH** (Thyroid stimulating hormone) - to check thyroid function
- **Free Cortisol** and **Creatinine** levels - rule out **Cushing syndrome**
- **17-hydroxyprogesterone** - to rule out congenital adrenal hyperplasia
- **IGF-1** - to rule out **acromegaly**

Non-Laboratory Tests

A pelvic ultrasound (transvaginal and/or pelvic/abdominal) is used to evaluate enlarged ovaries. With PCOS, the ovaries may be 1.5 to 3 times larger than normal and characteristically have more than 12 or more follicles per ovary measuring 2 - 9 mm in diameter. Often the cysts are lined up on the surface the ovaries, forming the appearance of a "pearl necklace." The follicles tend to be small and immature, thus never reaching full development. The ultrasound helps visualize these changes in more than 90% of women with PCOS, but they are also found in up to 25% of women without PCOS symptomology.

Laparoscopy may be used to evaluate ovaries, evaluate the endometrial lining of the uterus, and sometimes used as part of surgical treatment.