Symptoms Associated with Polycystic Ovarian Syndrome (PCOS) [1]

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Polycystic ovarian syndrome or PCOS is one of the most common reproductive conditions in women, and its symptoms include cystic ovaries, menstrual irregularities, and elevated androgen or male sex hormone levels. During the 1930s, Irving Freiler Stein and Michael Leventhal identified the syndrome and its symptoms. Women who experience symptoms of PCOS may also experience secondary symptoms, including infertility [3] and diabetes. Though estimates vary and the causes of the syndrome are not clear as of 2017, PCOS affects approximately ten percent of women of reproductive age. Women who suspect they have symptoms of PCOS should see a doctor, as early treatment may help prevent long-term implications such as infertility [3], diabetes, and some types of cancers.

Research on PCOS began during the 1930s, when Stein and Leventhal originally investigated the condition, which was then called Stein-Leventhal syndrome. Researchers Stein and Leventhal first identified symptoms associated with what was later called PCOS in a study they published in 1935. The two men found that several of their patients exhibited symptoms of infertility [3], excess facial and body hair, and menstrual irregularities consisting of either the absence of a menstrual period or an infrequent, sporadic menstrual cycle. When Stein and Leventhal examined women with those symptoms, the researchers observed that the women also had cysts in their ovaries. During those examinations, the two researchers removed the ovaries of some of their patients and discovered that surgically excising ovarian tissue could be therapeutic. The women who had their ovaries excised often found their menstrual periods restored.

In the following decades, researchers and physicians continued to identify novel symptoms that could be used to diagnose women with PCOS. In the 1930s and 1940s, physicians could only diagnose women with PCOS through surgical examination of cysts in the ovaries, one of the main symptoms of PCOS. In 1958, researchers at Harvard Medical School in Boston, Massachusetts, Janet McArthur, Francis Ingersoll, and Jane Worcester documented that women with cystic ovaries also had elevated gonadotropins in their urine. Gonadotropins, hormones [4] secreted by the brain, stimulate hormonal production in the ovaries in women or testes [6] in men. Finding elevated gonadotropins in the urine enabled physicians to diagnose PCOS using a non-surgical method. Physicians commonly used that method during the 1970s and 1980s. However, by the 1990s researchers determined that such a method was unreliable, as women have different amounts of gonadotropins in their urine at different times of their menstrual cycle. In the late 1980s, physicians began using ultrasound [6] technology to diagnose women with PCOS. Ultrasounds reflect ultrasound [6] waves into the abdomen and can show the cysts in the ovaries, a characteristic that is common to the condition. By 1991, a transvaginal ultrasound [7] could reliably detect cystic ovaries, and for this reason the primary means of diagnosis.

As of 2017, physicians look for three primary symptoms to diagnose women with PCOS. Symptoms associated with PCOS can affect women differently depending on a variety of factors, leading to discrepancies in diagnosis of the syndrome. A syndrome functions as a group of symptoms that consistently occur together, though not all symptoms are required to be present for women to receive diagnosis. To receive a diagnosis of PCOS, a woman must exhibit at least two of the following symptoms: menstrual irregularity, elevated androgens [8], and/or cystic ovaries. Menstrual irregularity is diagnosed through patient history, meaning that the patient must account for her menstrual cycle over a period of time. Physicians identify elevated androgen levels in a woman with a blood or urine test. Androgens are male sex hormones [9]. Finally, physicians may also identify ovarian cysts in women through a transvaginal pelvic ultrasound [6]. A transvaginal pelvic ultrasound [6] involves the insertion of a thin scoped camera into the vaginal canal to examine the reproductive structures with ultrasound [6] waves. Those three symptoms are the primary symptoms of PCOS and a woman must exhibit at least two of those symptoms to be diagnosed with PCOS. The symptoms used for diagnosis of PCOS are also known as the Rotterdam criteria.

Disruption of menstrual function is one of the three primary symptoms of PCOS. Disruption of menstrual function can include either menstrual absences or menstrual irregularities. When a woman misses her period or experiences sporadic, random menstrual cycles, it means that the glands of the brain, the ovaries, and the uterus [10] are not communicating with one another. In a healthy woman, the uterine lining or endometrium [11] builds up to prepare for a fertilized egg [12] in a cycle that lasts twenty-eight days. The endometrium [11] builds up to provide a hospitable environment for a developing embryo. An egg [13] is ovulated or released by the ovary [15] midway through a woman’s cycle. If sperm [16] does not fertilize the egg [13] by the end of the twenty-eight
Over As a result of many of the secondary symptoms of PCOS, women may experience ovulation difficulties, which may make it difficult for the woman to get pregnant. Cystic ovaries can also cause ovulation. Insulin may help induce ovulation. Women who experience ovulation difficulties getting pregnant with PCOS can be given medications such as clomiphene citrate or Metformin to help induce ovulation. As a result of many of the secondary symptoms of PCOS, women with PCOS experience higher rates of depression and anxiety. Over thirty-four percent of women with PCOS deal with depression at some point in their lives compared to seven percent of the healthy female population. Relation of infertility to inadequacy, unideal body image, and difficulties losing weight can all lead to depression and anxiety in women with PCOS. Women may also develop eating disorders as a result of their weight gain. Both primary and secondary symptoms of PCOS may build up in women over time to cause other more serious conditions. Such
conditions include obesity, cancer, and other reproductive conditions. Obesity or weight gain can increase the likelihood of a woman to develop sleep apnea, the pause of breathing while asleep, high blood pressure, and high cholesterol. Hormonal imbalances may increase a woman's susceptibility to certain types of cancers, specifically breast and endometrial cancers. Women may also be more prone to heart disease and heart attacks if they become insulin resistant. If a person with PCOS becomes pregnant, she is also more likely to have a miscarriage or the loss of a pregnancy. PCOS may also occur simultaneously with other diseases, including endometriosis, a disease in which the cells of a woman's uterine lining migrate to other parts of her body and shed with each menstruation. Endometriosis can cause abnormally heavy and painful periods, gastrointestinal symptoms, and infertility.

Women with PCOS treat their symptoms by trying to balance their hormonal production, and the treatment may change depending on whether the woman wishes to become pregnant. Treatment of the symptoms of PCOS include hormonal birth control pills, rings, patches, or injections for women who do not wish to become pregnant. Women who do want to become pregnant can take drugs designed to address infertility by inducing ovulation. Such drugs include clomiphene citrate, a nonsteroidal assisted reproductive technology medicine designed to induce ovulation in women who cannot ovulate for a known medical reason. In-vitro fertilization may also be used to help women who are unable to ovulate and get pregnant. Physicians recommend women to increase their physical activity and eat a balanced diet to combat the development of insulin resistance, Type II diabetes, and obesity. Treatment and maintenance of the symptoms of PCOS is the primary way for women to avoid unwanted secondary side effects, though there is no single treatment that helps every woman with PCOS, and no cure to the syndrome as a whole.

While some of the primary symptoms of the syndrome directly cause secondary symptoms, physicians and scientist know little about the causes of PCOS. Though the exact causes are unknown as of 2017, research has indicated that there may be a genetic link. Multiple studies have supported the role of genetic factors in PCOS. However, more research is needed. Also, since many of the symptoms seem to cause the other symptoms without any causational pattern, scientists and physicians agree that research has yet to uncover that relationship.

PCOS is estimated to affect eight to seventeen million women between the ages of eighteen and forty-four in the United States. If left untreated, the symptoms of the syndrome may lead to irreversible health conditions that can negatively affect a woman's quality of life. Knowledge of the symptoms, early diagnosis, and developing a suitable treatment plan are all key to managing the symptoms associated with PCOS.

Sources

“Metformin increases the ovulatory rate and pregnancy\textsuperscript{21} rate from clomiphene citrate\textsuperscript{19} in patients with polycystic ovary\textsuperscript{14} syndrome who are resistant to clomiphene citrate\textsuperscript{19} alone.” \textit{Fertility and Sterility} 75 (2001): 310–15.


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Publisher
Arizona State University. School of Life Sciences. Center for Biology and Society. Embryo Project Encyclopedia.

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Format
Articles\textsuperscript{43}

Last Modified
Wednesday, July 4, 2018 - 04:40

DC Date Accessed
Tuesday, December 19, 2017 - 21:52

DC Date Available
Tuesday, December 19, 2017 - 21:52

DC Date Created
2017-12-19

DC Date Created Standard
Tuesday, December 19, 2017 - 07:00

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