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Association between polycystic ovary syndrome and Insulin resistance

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ABSTRACT : **PCOS is a common endocrine-metabolic disorder with serious health consequences for women, including alarming rates of infertility. Although the exact cause is unknown, several hormonal imbalances are known to be involved, including hyperandrogenemia, insulin resistance (IR), and hyperinsulinemia. Insulin appears to disrupt all components of the hypothalamus-hypophysis-ovary axis, resulting in impaired metabolic signaling but intact mitogenic and steroidogenic activity, favoring hyperandrogenemia, which appears to be the primary cause of the PCOS clinical picture. Androgens, in turn, may contribute to IR by increasing free fatty acid levels and changing the composition and functionality of muscle tissue, perpetuating the IR-hyperinsulinemia-hyperandrogenemia cycle. Nonobese women with PCOS have distinct biochemical and hormonal profiles, among other characteristics. However, both lean and obese patients have chronic inflammation, which mediates the long-term cardiometabolic problems and comorbidities seen in women with PCOS, such as dyslipidemia, metabolic syndrome, type 2 diabetes, and cardiovascular disease. Given these serious consequences, it is critical to fully understand the pathophysiologic connections that underpin PCOS to develop superior therapeutic approaches and ensure improved quality of life for women suffering from this illness.**

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I. INTRODUCTION

Androgens are male sex hormones that are normally present in small amounts in women. Polycystic ovary syndrome (PCOS) is a condition in which the ovaries produce an abnormally high level of androgens. Polycystic ovary syndrome is named after the numerous small cysts (fluid-filled sacs) that develop in the ovaries (1). However, some women with this disorder do not develop cysts, while others do. Ovulation is the release of a mature egg from an ovary. This happens so that a male sperm can fertilize it, If the egg does not hatch, it is expelled from the body during your period. A woman may not produce enough of the hormones needed to ovulate in some cases. The ovaries may grow many tiny cysts when ovulation is absent. Androgens are hormones that these cysts produce. Androgen levels are frequently elevated in women with PCOS. This may worsen a woman's menstrual cycle issues. And many of the symptoms of PCOS can be brought on by it. Medication is a common component of PCOS treatment, although it doesn't treat PCOS, this can help with symptoms and even some health issues (2)

PCOS causes include:

The precise cause of PCOS is unknown. However, many PCOS women have insulin resistance, which means their bodies don't use insulin effectively. Insulin levels rise in the body, potentially leading to higher androgen levels. Obesity can also raise insulin levels, exacerbating PCOS symptoms (3)

PCOS symptoms include:

missing periods, irregular cycles, or light cycles, big ovaries or ovaries with numerous cysts, excessive body hair, especially on the back, stomach, and chest (hirsutism), gaining weight, especially around the midsection (abdomen), greasy skin, acne baldness with a male pattern, thinning hair Infertility, small bits of extra skin around the neck or under the armpits (skin tags), spots of thick or dark skin (4).

Identifying PCOS

Some of the PCOS symptoms resemble those of other medical conditions. As a result, many tests were conducted, including Ultrasound Using sound waves and a computer, this test generates images of the blood arteries, tissues, and organs. It is used to evaluate whether cysts are present and how big the ovaries are. Blood

tests are used to screen for high levels of androgens and other hormones and can also be used to measure the thickness of the uterine lining (5).

Medications for PCOS:

Age and the intensity of the symptoms all play a role in how PCOS should be treated. Alterations to food and activity: A healthy diet and more exercise can assist with weight loss and discomfort relief. However, they may promote ovulation, help the body metabolize insulin more effectively, and lower blood sugar levels. Ovulation-inducing drugs have some hazards, such as an elevated risk of multiple birth (twins or more) and ovarian hyperstimulation, even if they can aid in the ovaries' natural release of eggs. When the ovaries create too many hormones, this happens. This could cause symptoms as pelvic pain and bloating in the abdomen. (6)

PCOS side effects:

Serious health problems are more likely to arise in PCOS-afflicted women. These include uterine cancer, high blood pressure, type 2 diabetes, high blood pressure, and heart and blood vessel issues. Women with PCOS frequently experience difficulties getting pregnant (fertility) (7)

Features of PCOS

One of the obvious characteristics of PCOS that some women suffer is weight gain. Other physical signs include hair growth and acne. Laser hair removal and electrolysis are two cosmetic procedures that could improve your self-esteem (8)

Insulin resistance:

Normally, after eating, the levels of the hormone insulin rise temporarily, encouraging the liver and muscles to absorb blood sugar and use it as fuel. Low insulin and blood sugar levels result from this. In a fasting blood test, normal insulin sensitivity results in normal blood sugar levels and normal insulin levels; insulin resistance results in normal blood sugar levels but high insulin levels. Because the pancreas needs to create increasing amounts of insulin to communicate. Insulin overuse results in inflammation and weight gain. A physiological factor underpinning PCOS is an excess of insulin, which can also result in Type 2 diabetes and heart problems (9).

The connection between insulin resistance and PCOS

Patients with PCOS, both obese and thin, frequently have insulin resistance. It affects 30–75% of PCOS individuals who are thin and 70–95% of obese PCOS patients (10). High insulin levels are a major contributor to PCOS and not just one of its manifestations. High insulin levels can hinder ovulation and increase the amount of testosterone produced by the ovaries (11).

PCOS is acknowledged as a risk factor for developing diabetes (12). Although the characteristics of insulin resistance manifest before those of PCOS, it is believed that insulin resistance may contribute to the development of PCOS. as opposed to the reverse Elevated insulin levels may make inflammation and other metabolic issues related to PCOS worse.

Most importantly, not all people with insulin resistance develop PCOS; some women having insulin resistance do not. Some specialists assert that the brain's pituitary and hypothalamus are affected by obesity-related insulin resistance, which increases the synthesis of androgenic hormones that cause PCOS (13). Unrelated to PCOS, excessive androgenic hormone secretion raises the likelihood of female infertility and ovarian disorders in women. Depression is linked to each of these ailments, but when they combine, the risk of depression soars. Corresponding to this, there is a correlation between insulin resistance and infertility rather than the reverse. Increased insulin levels might cause inflammation and other metabolic issues related to PCOS worsen.

PCOS hormonal fluctuations interfere with healthy early embryogenesis, and insulin resistance can cause miscarriage because the developing baby obtains inadequate nutrition and support.(14) Infertility and early miscarriage can make bringing a baby to term challenging when PCOS and insulin resistance interact. Insulin resistance or PCOS are risk factors for developing gestational diabetes. (15)

According to one study, an increase in PCOS over the previous ten years has been associated with an increase in obesity and weight gain (16). A "galloping surge in PCOS in combination with increased prevalence of type 2 diabetes," according to another study (17).

Insulin resistance should be frequently evaluated in PCOS-afflicted women to detect the condition early and start therapy (18).

Insulin resistance is checked for using the following tests.

Fasting Insulin Level Test: This quick blood test finds out how much insulin is present in the body. The patient must fast prior to having blood collected. Numerous studies have discovered a strong correlation between fasting insulin levels and insulin resistance. Additionally, this test identifies insulin resistance earlier and more precisely than fasting blood sugar does (see below) (19).

Fasting Blood Glucose Test: Before having blood collected to check the patient's blood sugar level, the patient will be given instructions on how long to fast.

• Glucose Tolerance Test: The patient will have a sugary drink while their blood sugar levels are measured. Blood sugar levels will be checked repeatedly after drinking the beverage to gauge how long it takes the cells to metabolize the sugar. If blood sugar levels are elevated for longer than usual, the patient may be insulin resistant.

• Glycosylated Hemoglobin A1C: A blood test that assesses the three-month average of a person's blood sugar levels.

Blood will be obtained to check the patient's blood sugar level after the patient has been ordered to fast for a predetermined period of time.

• Glucose Tolerance Test: The standard of care for the insulin resistance component of PCOS is weight loss, aerobic exercise, and the diabetic medication metformin, which increases insulin sensitivity. Additionally, resistance training might be useful, but additional research is required (20). Oral contraceptives are the other officially suggested treatment for PCOS, however they can affect the disease's underlying factors of insulin resistance and sugar homeostasis (21). A blood sugar test will be carried out.

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