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PREVALENCE AND RISK FACTORS OF PCOS AMONG ADOLESCENTS

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ABSTRACT

A complicated group of metabolic, reproductive, and psychological conditions that affect women throughout their lives is known as polycystic ovarian syndrome (PCOS). PCOS is a hormonal imbalance disorder that affects women who are fertile. High levels of male androgens, such as testosterone, are indicative of this condition. Amenorrhea (absence of menstruation), anovulation (absence of ovulation), hirsutism, acne, and obesity are some of the symptoms that may result from this. Metabolic impairment is another effect of PCOS.

The ovary contains several immature follicles that are located peripherally and range in diameter from 2 to 5 mm.

Hormonal imbalances cause these follicles to not mature, which results in an irregular menstrual cycle. PCOS is a complicated group of metabolic, reproductive, and psychiatric problems that affect women at all stages of their lives. Since infertility is the primary

complication of polycystic ovarian syndrome, the condition is neither deadly nor life-threatening. Serious illnesses like obesity, hypertension, insulin-resistant type-2 diabetes mellitus, endometrial malignancies, ovarian cancer, etc. can all be directly linked to PCOS. The pituitary's hormone levels may change as a result of stress. There are noticeable anomalies because the menstrual cycle is hormone-based.

Keywords: Obesity, Hormone Levels, Irregular Menstrual Cycle, Hyperandrogenism, Hirsutism

INTRODUCTION

A prevalent hormonal condition that affects more and more women between puberty and menopause is called PCOS (Polycystic Ovarian Syndrome). The term "syndrome" refers to a collection of symptoms that occur simultaneously. Hyperandrogenism and anovulation in women of reproductive age are the hallmarks of PCOS, a clinical syndrome [1]. PCOS-affected women experience amenorrhea, hirsutism, and obesity. Polycystic ovaries, high levels of androgens (male hormones), and irregular menstrual cycles are its hallmarks [2]. One of the most prevalent hormonal disorders affecting women in their reproductive years (18–40 years old) is PCOS. PCOS affects an estimated 105 million women worldwide, or 6–26%. PCOS affects 12–21% of women in their reproductive years, yet many of them do not receive treatment. Although there is evidence of dominant X-linked inheritance participation that is activated by certain environmental factors including diet and lifestyle choices, the exact origin of the condition is unknown [3]. The precise cause of PCOS, a complicated illness affecting 5–10% of

women of reproductive age, is yet unknown. However, it is believed to be connected to environmental, hormonal, and hereditary variables. Because polycystic ovaries cannot produce the typical levels of hormones needed to release one egg per month, women with PCOS are unable to produce or release one egg at ovulation each month [4]. Acne, hirsutism, and hyperandrogenism—an increase in male hormones complicate PCOS-affected women. In addition to being diagnosed with type-2 diabetes and sleep apnea, women with this illness are typically obese and have poor glucose intolerance [5].

The most prevalent issue associated with PCOS is irregular menstruation, which affects about 80% of individuals. Oligomenorrhea, also known as secondary amenorrhea, and occasionally menorrhagia, often known as primary amenorrhea, are the typical menstrual irregularities. Despite ovulation, 20% of women may appear to have regular periods. 50–60% of people have hirsutism, 15–20% have acne, and 5 percent of PCOS individuals have androgenic alopecia [6]. Between 30 and

75 percent of PCOS patients are obese, and most of them have an android distribution of fat along with insulin resistance symptoms such as skin tags and acanthosis nigricans. Patients with lean PCOS have biochemical indications of insulin resistance even though they do not exhibit clinical signs of the condition [7].

PCOS includes a number of major side effects. Elevated estrogen levels raise the risk of endometrial hyperplasia and, ultimately, endometrial cancer. Androgen levels are frequently high, which raises the risk of hirsutism and metabolic syndrome. Increased ovarian androgen production may be a result of hyperinsulinemia brought on by insulin resistance [8]. Androgen excess raises the risk of cardiovascular conditions, such as hypertension, over time. Women with PCOS are more likely to develop diabetes, obesity, hypertension, cardiovascular disease, impaired glucose tolerance, and dyslipidemia due to the pituitary gland's overproduction of luteinizing hormone (LH) [9].

Adolescents are increasingly being diagnosed with polycystic ovary syndrome. Between 3 and 11% of teenagers are thought to be affected by this issue [10]. Because polycystic ovarian syndrome is linked to hormonal and metabolic abnormalities in the patient's body, it may increase the risk of developing a number of other conditions, including obesity,

metabolic syndrome, hypertension, type 2 diabetes, and non-alcoholic fatty liver disease [11]. It is ambiguous and challenging to establish the link between insulin resistance and hormonal imbalance at the biomolecular level. 10% of women with PCOS will have diabetes by the time they are 40 years old, and 75% of them have insulin resistance. Metabolic syndrome is more common in women with PCOS than in the general population. A number of population-related cardiovascular disease risk factors combine to form metabolic syndrome (MBS). Independent of obesity, insulin resistance (IR), glucose intolerance, dyslipidemia, hypertension, and central obesity, hyperandrogenemia is a risk factor for MBS [12].

The most widely used standard for diagnosing PCOS in adults is the Rotterdam criteria. Polycystic ovarian morphology (PCOM) was defined as an ovarian volume of at least 10 cm³ or 12 or more 2–9 mm follicles on the ovary. Based on these criteria, it is currently known that 70% of adolescents will develop PCOM. Adolescents with PCOS frequently exhibit pathognomonic symptoms [13].

Early detection of PCOS is beneficial for managing its long-term metabolic and reproductive health consequences. When young women are identified with this chronic ailment, treatment should be individualized and take into consideration

the subtleties of the condition [14]. Late puberty and early adolescence are times when PCOS can be detected. Changes in lifestyle and the environment are the main causes. PCOS appears to be a hereditary condition in which the ovaries are unable to produce the appropriate amount of hormones. The body experiences some endocrinological changes as a result, including an increase in estrogen levels, a 10 IU/ml rise in LH levels, and a consistent level of FSH [15]. The most common cause of infertility in women is PCOS, a complex condition that has been linked to gynecologic malignancies and cardiovascular illness, according to new research [16].

Adipose tissue is regarded as an immunomodulatory and endocrine organ. It causes insulin resistance and hyperinsulinemia by secreting leptin, adiponectin, and cytokines that affect and disrupt the insulin signaling pathways in the area of the liver and muscle. Infertility or miscarriage may result from insufficient oocyte maturation caused by increased LH secretion by insulin [17]. When the waist line is greater than 88 cm and the body mass index is greater than 30 kg/m², obesity is considered. Hip/waist ratio >0.85. Hyperinsulinemia is the cause of between 50% and 70% of PCOS cases. The adrenal gland and hypothalamic-pituitary-ovarian axis are also somewhat engaged. LH is

induced by insulin, which results in "thecal hyperplasia" (enlargement of the organ or tissue) and the secretion of some "androgens" and "testosterone," where epi-androstenedione is transformed into "oestrogen" in the granulosa cell region. Peripheral epi-androstenedione is converted to "oestrone" and "oestrogen" and "inhibin" levels rise [18]. The "LH surge" could result from these. Hirsutism results from hyperandrogenism's reduction of sex hormone binding globulin (SHBG), which raises testosterone levels. The smaller-sized follicles are destined to die in the late follicular stage, but androgen inhibits their apoptosis and suppresses the growth of the dominant follicle [6].

Pathological conditions of PCOS:

1. One of the pathological diseases associated with PCOS is the development of ovarian follicular cysts. The follicles develop into cysts that surround the ovary and are often larger than one centimeter.
2. An increase in male hormones (hyperandrogenism) causes acne and hirsutism (excess facial hair).
3. The ovaries are surrounded by several cysts (Polycystic Ovaries).
4. Oligomenorrhea, or irregular menstrual cycles
5. People with insulin resistance experience obesity.
6. Lack of ovulation makes it

difficult to conceive.

7. Gaining weight and gaining more fat, particularly in the stomach region.

8. Abnormal blood fats [19].

Infertility is one of the most distressing and annoying signs of PCOS. Infertility can be managed in a variety of methods, and many women become pregnant following treatment. 75% of women of reproductive age have polycystic ovaries on ultrasonography, while 11–21% of women have PCOS [20].

Follicles grow and produce eggs during each menstrual cycle, one of which is released at ovulation. The follicles are supposed to disintegrate and vanish after this process is finished. When PCOS is present, ovulation does not occur and these follicles cease growing around halfway to maturity. The follicles develop into cysts, which are located just beneath the surface of the ovary and are typically smaller than 1 cm. If more than 12 follicles are detected on a single ovary during an ultrasound, the diagnosis of polycystic ovaries is confirmed.

Due to a surge in testosterone, these polycysts produce a hormonal imbalance. This may lead to irregular periods, acne, and an increase in body and facial hair [21].

PCOS symptoms

Irregular periods.

Because ovulation is not happening as it should, females with PCOS experience

erratic hormone activity. The menstrual cycle is disturbed as the body receives conflicting signals. Women's periods might differ greatly from one another.

They might be irregular, infrequent (oligomenorrhea), heavy, or absent (amenorrhea).

certain women who have irregular or nonexistent periods may develop a very thick lining in their uterus, which in rare cases may result in uterine cancer [22].

Having trouble getting pregnant

One of the most annoying PCOS symptoms is this one. The biggest cause of worry is elevated androgen levels. Ovulation may become irregular as a result of elevated androgen levels. Some women with PCOS will naturally become pregnant without the need for medical intervention [23].

Overgrowth of hair

Hirsutism is the term for excessive hair development on the face, thighs, back, stomach, and nipples caused by a high amount of androgens (male hormones) [15].

Loss of scalp hair

Alopecia is a problem that affects women with PCOS and is caused by an increase in testosterone levels [14].

Acne

Acne can develop on the face, back, and other parts of the body and is also brought on by high androgen levels [24].

Resistance to insulin

Up to 80% of women with PCOS have

insulin resistance, which makes it difficult for the body to use insulin for its intended purposes. The pancreas is a gland that secretes insulin. By transferring glucose, or sugar, from the food we eat into the bloodstream, it controls our blood sugar levels. The body creates more androgens when blood levels of insulin are high. These same male hormones can cause weight gain, hairiness, irregular periods, acne, and trouble ovulating, among other PCOS symptoms. Patches of darker skin on the back of the neck, beneath the arms, and in the groin area (within the upper thighs) can occasionally result from elevated insulin levels [25].

In addition to being inherited, lifestyle factors (such being overweight) or a mix of the two can produce insulin resistance. Gaining weight raises the incidence of PCOS. Diabetes and other long-term health problems can result from insulin resistance. The bodies of many women with PCOS overproduce insulin to compensate for their impaired sensitivity to the hormone [26].

Weight Issues

Compared to women in a healthier weight range, overweight women are more likely to experience PCOS symptoms. PCOS affects up to 10% of women who are within a healthy weight range. This rises to up to 30% of PCOS-afflicted overweight women. Ovulation frequently resumes on its own when women with a body mass index (BMI)

of more than 25 lose weight. Another factor contributing to weight increase is insulin resistance [27].

Long-term consequences

Diabetes: Women who have the illness are more likely to acquire type 2 diabetes or pre-diabetes because the majority of them are insulin resistant [28].

Gestational diabetes: Pregnant women with PCOS are more likely to acquire gestational diabetes [29].

Cardio-vascular disease: Women who are overweight have a higher chance of developing heart disease and high blood pressure [30].

The metabolic syndrome: is characterized by obesity, elevated blood cholesterol, and increased glucose intolerance, which is closely linked to type 2 diabetes. Endometrial cancer is three times more common in women with PCOS [31].

The endometrium Cancer: uterine lining, may thicken and produce malignant cells in women who have little or no periods [25].

PCOS-Related Endocrinological Changes

PCOS is a diverse illness that usually manifests in adolescence. It is traditionally defined by symptoms of androgen excess (hirsutism, acne, alopecia) associated with anovulation characteristics (amenorrhoea, oligomenorrhea, irregular periods). Elevated blood androgen and luteinizing hormone (LH) concentrations—the most common endocrine abnormality—as well

as normal follicle-stimulating hormone (FSH) levels are the hallmark biochemical abnormalities [32].

Crucially, insulin resistance and hyperinsulinemia are key metabolic abnormalities linked to PCOS that raise the risk of type 2 diabetes in later life [33].

PCOS causes the body to undergo a number of endocrinological changes, some of which are mentioned below: While oestrogen levels rise and LH levels increase by 10 IU/ml, FSH levels stay constant. However, the problem is that the FSH/LH ratio is declining. Hyperandrogenism causes a reduction in SHBG (sex hormone binding globulin). Higher amounts of both testosterone and epi-androstenedione are found [34].

There has been a small increase in prolactin. 50–70% of PCOS individuals had fasting insulin levels greater than 10 ml U/L. Patients with PCOS experience disruptions in their thyroid function, which leads to hypothyroidism [35].

Additionally, these patients had higher levels of sulphate, very low levels of cholesterol and density lipoprotein, and higher levels of testosterone and LH hormone than FSH [36].

PCOS is caused by a number of hereditary and environmental variables [37]. Beyond the reproductive system, this complex illness has an impact on the metabolic, cardiovascular, immunological, and

psychological well-being of afflicted women [38]. The most promising genes linked to PCOS are thought to be those involved in steroidogenesis, hypothalamic-pituitary pathways, gonadotrophin action, insulin action and secretion, adipose tissue disturbances, homeostasis, lipid metabolism, and chronic inflammation. Over the past ten years, genome-wide association studies (GWASs) have significantly advanced our understanding of PCOS pathophysiology [39].

CONCLUSION

Polycystic Ovarian Syndrome (PCOS) is commonly associated with ovarian cyst formation, insulin resistance, and hyperinsulinemia. Insulin resistance is influenced by genetic factors, environmental factors, and hormonal imbalances. Based on the survey conducted among female students, it can be concluded that young female teenagers and adults are more affected. Many researchers have reported that the prevalence of PCOS has increased over time, largely due to inappropriate lifestyle habits, poor dietary patterns, and high levels of stress. PCOS may also lead to infertility in many cases. It is a common endocrine disorder that contributes to significant reproductive and non-reproductive morbidity.

Preventive and precautionary measures should be adopted by both affected and non-affected women. A proper healthy diet

and regular physical activity, including yoga, are among the most effective preventive strategies. Specific yoga poses such as Malasana (Garland Pose), Setu Bandhasana (Bridge Pose), and Chakravakasana (Cat–Cow Pose) help reduce PCOS symptoms and assist with weight management. Early medical consultation is recommended, as physicians can provide appropriate treatment options, including medications such as metformin and other therapies.

Additionally, reducing high-carbohydrate intake can help prevent insulin spikes. Choosing complex carbohydrates between meals helps maintain stable blood glucose levels. These are found in whole grains, fruits, vegetables, cooked dry beans, nuts, and peas. Foods rich in myo-inositol (MI) and omega-3 fatty acids can also support PCOS management. Physical activity is equally essential, as it helps lower blood sugar levels and improves overall health. Type 2 diabetes mellitus and obesity are commonly associated with PCOS in women. For those with type 2 diabetes or impaired glucose tolerance who do not respond adequately to lifestyle modifications, metformin is recommended. Metformin has also shown beneficial effects in managing hirsutism, weight-related issues, and dysregulation of glucose and insulin.

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