IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 7, April 2024

A Review on PCOD: Polycystic Ovarian Disease

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Abstract: *Among women of reproductive age, PCOD (polycystic ovarian disease) is a hormonal condition. Patients with PCOD have larger ovaries with little cysts on the outer margins as a result of abnormal androgen and estrogen metabolism and secretion rates. Although the exact cause of the syndrome is unknown due to its complicated pathophysiology, insulin resistance is thought to play a significant role. Our goal is to look into the effects of synthetic and herbal drugs on serum levels of sex hormones and ovarian tissue in light of the rising prevalence of PCOD, related mental and physical issues, and the role that changes in sex hormones play in the development of this disease. Numerous pharmacological research has documented the application of different Ayurvedic medicinal plants and the significant role their ingredients play in PCOD treatment.As a result, this medication may be somewhat helpful in treating this syndrome by influencing various hormones, ovarian shape, weight, and serum levels. It may also present a chance to research and find novel bioactive compounds. Several synthetic and herbal medications that may be used to treat PCOD were covered in this review.*

Keywords: PCOD, Pathophysiology, Allopathy Medication, Complications

I. INTRODUCTION

Polycystic Ovarian Syndrome, also referred to as PCOS or PCOD [Polycystic Ovarian illness], is a highly prevalent hormonal illness that is one of the main causes of infertility in women globally. stein-leventhal syndrome is another name for PCOS, named for the two physicians who first identified it in 1935. Women with PCOS (polycystic ovarian syndrome) usually have several little cysts along the perimeter of their ovaries. When ovaries are polycystic, they have an abundance of small cysts (less than 8 mm in size) and produce more follicles each month than usual. When compared to normal ovaries, polycystic ovaries begin to produce at least twice as many follicles, the majority of which enlarge and mature but do not release an egg.The cysts are the egg-containing follicles that do not develop properly because of hormone disturbance.[1].The most prevalent endocrine condition affecting women of reproductive age is called PCOS (polycystic ovarian syndrome), and it is associated with a greater incidence of anxiety and depressive symptoms. In 1989–1995 there was a proposal that androgen secretion dysregulation, or functional ovarian hyperandrogenism (FOH), was the etiology of polycystic ovary syndrome (PCOS).[2]

The classification of endocrine, nutritional, and metabolic diseases includes PCOD (Polycystic Ovary Syndrome) in the International Classification of Diseases (ICD). In particular, PCOD is designated with the ICD-10 code E28.2 (ICD-10).[12]

II. WHAT IS PCOD

A condition known as polycystic ovarian syndrome, or PCOS/PCOD, is characterized by an imbalance in a woman's hormones. It may interfere with their menstrual cycle and make conception challenging. If left untreated, it might eventually cause major health issues like diabetes and heart conditions. Most PCOS-affected women develop several little cysts on their ovaries. It is known as polycystic ovary syndrome for this reason. The cysts cause an imbalance in hormones but are not dangerous. Prompt diagnosis and treatment can aid in managing symptoms and avert chronic issues.

A mature follicle, which is also a cystic structure, develops throughout a typical menstrual cycle that includes ovulation. A developed follicle with an ovulation-ready diameter measures between 18 and 28 mm. The primary distinction between polycystic and normal ovaries is that, while polycystic ovaries have a large number of tiny antral follicles containing eggs, the follicles do not mature and grow normally, which prevents ovulation. Women who have polycystic ovaries experience irregular menstrual cycles because their ovaries do not ovulate regularly.

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Women with polycystic ovaries often have an excess amount of the male hormones testosterone and androstenedione, resulting in high testosterone levels in the blood which leads to increased facial and body hair growth.[3]The two main characteristics of PCOS are having numerous ovarian cysts and producing an excessive amount of male hormones. Nonetheless, a few typical issues that women with PCOS may experience include the following:

- Prolonged or missing menstruation; heavy periods; hirsutism, or the growth of excessive body hair.
- Missing or erratic periods
- thinning and loss of hair at the scalp
- Hyperinsulinemia
- Issues with conception
- Problems with body weight[4]

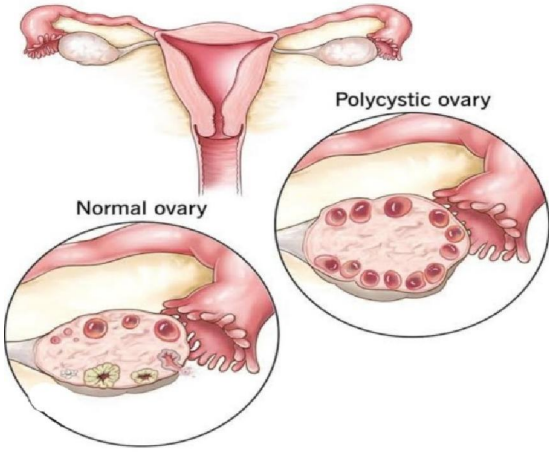

Fig 1: Difference between normal and polycystic ovary.

III. HISTORY OF PCOD

Although polycystic ovaries were first reported in the 19th century, it wasn't until 1935 that the syndrome was recognized and given its name in honor of Stein and Leventhal. In these early years, the condition was linked in seven patients to amenorrhea, obesity, and hirsutism; as a result, PCOS syndrome was originally known as Stein–Leventhal syndrome.

Before their study, which dates back to 1721, young married women who were infertile and somewhat obese had larger-than-normal ovaries that were bulkier than usual, but later furthermore, it went unnoticed. Chereaufirst described the sclerotic alterations in ovaries in 1844, but it wasn't until Stein and Leventhal conducted thorough studies on the subject that it was acknowledged.

Adams and his associates conducted an additional study in 1985 and discovered polycystic ovaries with an excessive number of follicles. They named this disorder multifollicularity. As per their description, polycystic ovaries are defined as those that have more than ten peripherally arranged cysts with a diameter of 2-3 mm.[4].

IV. PATHOGENESIS OF PCOD

There is still a lack of full knowledge regarding the underlying pathophysiology of PCOS. Numerous underlying pathophysiologic pathways are most likely present due to the variability of this illness.

1) Increased secretion of luteinizing hormone (LH) is the outcome of a change in gonadotropin-releasing hormone secretion.

2) Hyperinsulinemia and insulin resistance are brought on by changes in insulin production and action.

3) An increase in the production of androgen by the ovaries due to a malfunction in androgen synthesis.

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LH Secretion

One of PCOS's distinguishing features is LH hypersecretion. The secretion of LH is pulsatile. The frequency and amplitude of the LH pulse are higher in women with PCOS, which leads to greater 24-hour secretion. The increased frequency of gonadotropin-releasing hormone (GnRH) pulses in the hypothalamus is assumed to be the cause of this rise in LH secretion. Consequently, elevated LH causes the ovary's theca cells to produce more androgen.

Insulin Resistance and Hyperinsulinemia

Reduced glucose response to a given quantity of insulin is known as insulin resistance, and it is a typical metabolic abnormality linked to PCOS. In comparison to age-matched controls, obese women with PCOS have significantly worse insulin sensitivity than non-obese women with PCOS. Both types of women have a higher incidence of insulin resistance and hyperinsulinemia.Type 2 diabetes mellitus is known to develop earlier than insulin resistance. According to studies, between 30 and 40 percent of women with PCOS have poor glucose tolerance, and by the time they turn 40, up to 10 percent have type 2 diabetes.9,10 Numerous investigations have also demonstrated a robust association between hyperandrogenism and insulin resistance. This connection was first made in 1921 when Achard and Thiers wrote about a bearded woman who also suffered from diabetes.Insulin and LH work together to increase the production of androgen in ovarian theca cells. Insulin also increases the amount of free testosterone that is physiologically available by decreasing the synthesis and secretion of sex hormone-bindingglobulin, the hormone that binds testosterone in the bloodstream.10Although total testosterone concentration may be slightly raised or at the upper range of normal in women with PCOS and hyperinsulinemia, free testosterone is frequently elevated in these patients.

Overindulgence in Androgen

The ovarian theca cells produce more testosterone as a result of the rise in LH and hyperinsulinemia.10An increase in ovarian enzymatic activity involved in the production of testosterone precursors is most likely the main cause of the rise in testosterone output observed in PCOS patients.

V. SIGN AND SYMPTOMS OF PCOD

Fig 2: Signs of PCOD

Although the primary cause of PCOS is yet unknown, the illness can be identified by its signs and symptoms. PCOS, oligo-ovulation, hyperandrogenism (hirsutism, male pattern balding, acne, Acanthosis nigricans), obesity, hypertension, and dyslipidemia can all be detected with the use of these signs and symptoms.

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Oligoovulation

Oligoovulation, which is typically characterized as periods of ≥36 days or <8 cycles a year, is infrequent or irregular ovulation. Anovulation is the absence of ovulation when it is often expected (in a premenopausal, postmenarchal woman).

Overweight:

An accumulation of excess body fat to the point where it may be harmful to one's health is known as obesity, a medical condition. Individuals who have a body mass index (BMI) of more than 30 kg/m2, which is regarded as overweight, are often considered obese. Reduced values are used in several East Asian nations. Obesity raises the risk of several illnesses including ailments, in particular depression, osteoarthritis, type 2 diabetes, obstructive sleep apnea, cardiovascular diseases, and some types of cancer.

Hirsutism:

The presence of terminal coarse hairs in females distributed in a manner akin to that of males is known as hirsutism. It is a prevalent presenting problem in the dermatological outpatient department (OPD) for cosmetic reasons, affecting around 5–10% of women. Knowing the primary causative factor for hirsutism and how to prescribe the appropriate treatment are equally crucial as determining the cause of the condition.The most significant factor influencing the diagnosis is a shift in the type and pace of hair growth. A method for measuring hirsutism using video equipment and computer software has been developed.Digital imaging of hair development is captured, showing that hirsute and non-hirsute women differ significantly in terms of hair structure and growth rate.

Acne:

A prevalent skin ailment that affects many adults as well as over half of all adolescents is acne. It is brought on by modifications to the sebaceous gland and hair follicle that are connected to the skin as a result of androgen stimulation. In its more severe manifestations, it manifests as inflammatory papules, pustules, and nodules in addition to noninflammatory follicular papules or comedones.

Balding:

Female pattern hair loss is the term for male-like (or male-pattern) hair loss in women. A unique type of hair loss known as FPHL affects women who have androgenetic alopecia. The condition affects a lot of women. Diffuse hair thinning on the scalp is observed in FPHL as a result of either increased hair shedding or decreased hair volume. Losing between 50 and 100 hairs per day is typical.

Over-androgenism:

Hyperandrogenism, sometimes referred to as "androgen excess," is a medical condition marked by elevated amounts of androgens—male sex hormones like testosterone—in the female body as well as the side effects that come with these levels. This endocrinological condition is comparable to hyperestrogenism.

Acanthosis Nigricans:

A*canthosis nigricans* is a very frequent condition characterized by skin pigmentation. The most noticeable symptom of *acanthosis nigricans* is the presence of thick, velvety, dark skin patches.Additionally, the skin in question may itch or smell.These patches can show up on folds in the skin as well as other places like the neck, elbows, groin, armpits, knees, knuckles, lips, and soles of the feet. *Acanthosis nigricans* could indicate more serious health issues including PCOS and pre-diabetes.[5]

VI. COMPLICATIONS DUE TO PCOD

PCOD-Related Pregnancy Complications:

Miscarriage or early pregnancy loss: Women with PCOS have a threefold increased risk of miscarrying during the first few months of pregnancy compared to those without the condition.

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K diabetes: Pregnant women are the only ones who can get this type of diabetes. It can be treated, and if left under control, neither the mother nor the fetushave any serious complications.
Preeclampsia: A rapid spike in blood pressure that occurs after the 12th week of pregnancy and can impact the kidneys, liver, and brain of the mother.Eclampsia can result in mortality, convulsions, and damage to organs.
Preterm birth: If a baby is born before 37 weeks of pregnancy, it is referred to as "preterm."
Pregnant women with PCOS are more likely to give birth by cesarean or c-section. Recovery following a cesarean delivery might be riskier for the mother and the child because it involves surgery, and it can also take longer than from a vaginal birth.[3]

Hypertension:
Several studies have revealed that PCOD females have a greater incidence of hypertension According to a recent meta-analysis, the prevalence of hypertension was greater in PCOD patients than in control subjects. Menopausal women with a history of PCOD were not seen to have this at this time; only females of reproductive age were discovered to have this. According to the Dallas Heart study, women with PCOD (average age: 45) had higher rates of hypertension and body mass index than control women with regular periods. Furthermore, investigations matched by age, BMI, and ethnicity showed that this was still the case. When compared to controls, significant increases in both systolic and diastolic blood pressure have been noted in PCOD populations collectively.

Diabetes type I:
Numerous long-term studies have linked the risk of diabetes mellitus to PCOD. Women with PCOD are more susceptible to diabetes because they have metabolic abnormalities, such as insulin resistance, that persist after menopause. Numerous studies have examined the relationship between PCOD in older women and diabetes mellitus. Discovered in the CARDIA study that over the course of 18 years, girls with PCOD had a two-fold increased risk of acquiring diabetes.[6]

Cancer of the Ovaries:
Women who have early menarche, late menopause, anovulation, and polycystic ovaries are more likely to develop ovarian cancer. Another potential cause of ovarian cancer is the widespread use of medications like clomiphene to induce ovulation in PCOS patients Compared to normal women, PCOD women have a doubled risk of having ovarian cancer.

Breast Cancer:
The reasons for the correlation between PCOS and cancer are obesity, hyperandrogenism, prolonged steroid exposure, and infertility. The positive correlation between PCOS and the presence of a case history of cancer is supported by earlier research studies. In research involving 217 girls, When comparing women with PCOS to controls, the percentage of women with a positive case history of carcinoma was noticeably greater.

Infertility:
Clinical research revealed that women with PCOD had a heightened risk of infertility, which is typically caused by oligo/anovulation and metabolic changes. It is thought that PCOS women experience a higher rate of miscarriage than women in antiquity. A recent research demonstrated that an increased prevalence of physiological state polygenic disorder was supported by the findings of numerous other studies.In women with PCOD, preterm deliveries, prenatal toxemia, and cardiovascular illness are identified physiologically.
Furthermore, the babies of PCOS women were more frequently admitted to a newborn intensive care unit, which led to a greater rate of prenatal mortality, sometimes from multiple pregnancies.[10]

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VII. CONTROL OF PCOD

Fast eating and a modern lifestyle with little exercise exacerbate PCO syndrome. A healthy lifestyle improves insulin resistance, lowers testosterone, increases hair growth, and decreases body weight and belly fat. A balanced diet that is low in carbohydrates is crucial, as PCOS makes it difficult to lose weight, although doing so might lower the body's levels of male hormones and cause some women to begin ovulating on their own. The endocrine system is undoubtedly regulated by yoga and meditation, which may help manage PCOD.[7]

Western and Allopathic PCOS Treatments:

Western, or allopathic, medicine is known for its use of medications, therapies, and surgical techniques. Allopathic medicine relies heavily on prevention, acute care, and health maintenance. Obstetricians and gynecologists (OB-GYN specialists) in allopathic medicine specialize in female reproductive health, usually treating polycystic ovarian syndrome. Medication, lifestyle modifications, and nutraceuticals—dietary supplements—may all be used in treatment strategies.[8]

Modifications to Lifestyle for PCOD Improvement:

In order to prevent and treat metabolic diseases, clinical guidelines for a range of illnesses place a strong emphasis on the necessity of regular physical exercise, maintaining a healthy body weight, adhering to healthy food habits, and giving up tobacco use. Prioritizing one's own physical and mental well-being is a personal responsibility that leads to a more fulfilling life but is by no means a quick fix.

Exercise:

A recent meta-analysis suggests that exercise intensity, as opposed to exercise volume, maybe the most significant component in enhancing health outcomes. This research supports the benefits of exercise and indicates that the biggest effects on body composition, insulin resistance, and cardiorespiratory fitness may come from high-intensity training.[9]

Medical Treatment:

Citrate Clomiphene (CC):

Starting on the second day of the menstrual cycle, it is administered 50 mg twice a day for a duration of five days. To determine whether ovulation is stimulated or not, hormonal tests and ultrasonic folliculometry should be used to track the therapy cycle. In 50–80% of cases, CC will ovulate.

Gonadotropin production:

Either human menopausal gonadotropin (HMG), recombinant FSH (Rec-FSH), urinary gonadotropin (uFSH), or purified gonadotropin (p FSH) is the gonadotropin that is employed. Rec-FSH is made from Chinese Hamster Ova (CHO) through genetic engineering, and it is 100% pure FSH. The rationale behind administering FSH alone in these individuals instead of LH is that high LH levels cause low-quality oocytes, a lower rate of fertilization and pregnancy, and a higher rate of early abortions. Rec-FSH use ensures that the FSH is pure, that the dosage required to induce ovulation is reduced, and that the stimulation period needed for sound ovulation is shortened.

GnRHanalogs:

GnRH analogue addition: In the past, a lot of people have claimed that supplementing gonadotropin therapy with GnRh-a will enhance the therapeutic outcome. However, when it came to the pregnancy rate, Fleming (1988), Hamburg (1990), and Hompes (1986) could not identify any appreciable differences. The rate of abortion and ovarian hyperstimulation did not differ significantly. Therefore, it is not advised to add GnRh-a at this time.

Sensitizers to Insulin:

Insulin sensitizers should be added as long as hyperinsulinemia is linked to increased testosterone levels and smaller follicle sizes.

Higher levels of estrogen, a greater number of immature tiny follicles (nuisance follicles), a higher incidence of ovarian hyperstimulation, and a higher incidence of abortion are linked to hyperinsulinemic women (45% of PCOD). This is where the concept of including Metformin in the therapy regimen—either in addition to CC or FSH—was born. Metformin (Glucophage) slows intestinal glucose absorption, lowers hepatic glucose output, and raises peripheral tissue

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glucose uptake (muscle and adipocytes). It is a popular medication for type 2 diabetics who are obese. After meals, 500 mg is taken orally three times a day.

Operation:

It is claimed that wedge resection of the ovaries is bad; this procedure is linked to the destruction of ovaries that are already diseased, and because of the postoperative adhesions, it may lead the patient to go from an ovulatory problem to an ovulatory and tubal problem.It would not be detrimental to try a drill if there was resistance to ovulation caused by either CC or FSH. Ovarian stimulation should be done after the drill because the effects won't last very long.

In general:

Weight control and diet management are essential components of the therapy plan for hyperinsulinemia. They gain from a low-calorie diet when trying to lose weight.

Reduce the amount of fat and carbs you eat at each meal to. Remind them time and again that the weight loss won't be significant. As long as there are no health reasons for them to avoid intense exercise, encourage these individuals to engage in moderate physical activity.[12].

Mineral Supplements:

Calcium concentrations are frequently abnormal in PCOS women, possibly as a result of vitamin D and thehormone parathyroid. Combining calcium and vitamin D supplements has been found to enhance lipid profiles, insulin resistance, hirsutism, testosterone levels, and monthly regularity, among other characteristics of PCOS. Magnesium plays a role in both neurological and insulin metabolism. Further research is necessary, particularly to determine the benefits of magnesium supplementation on depressed symptoms, as there is some indication that it may assist in lowering insulin resistance (IR) in women with PCOS[14].

VIII. CONCLUSION

In addition to medicine, a planned and balanced diet, physical exercise, and prevention are all necessary forthe treatment of PCOS in women. Thus, adhering to Dincharya and the Ayurvedic lifestyle in its entirety will be highly advantageous.COS is a multifactorial condition resulting from the interaction of genetic, endocrine, environmental, and behavioral variables. This leads to a heterogeneous phenotype that includes reproductive, metabolic, and psychological features that impact women's health and quality of life throughout their lives. It's interesting to note that the PCOS phenotype changes with aging in women as clinical aspects improve. All women with PCOS benefit from a personalized approach to diagnosis and therapy.

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