



Polycystic Ovary Syndrome (Pcos) Causes, Pathogenesis, Diagnostic Approach: A Literature Review

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Abstract:

Polycystic ovary syndrome (PCOS) represents the most common chronic reproductive and metabolic endocrine disorder affecting women of reproductive age, characterized by disturbances in ovulation, elevated androgen levels, and the presence of polycystic ovarian morphology (PCOM). Globally, an estimated 4% to 21% of women suffer from PCOS, primarily affecting those aged 18–39, often with obesity and a high body mass index. Patients face increased risks of reproductive, cardiovascular, psychological, metabolic, and neoplastic issues. Diagnosing PCOS is complex, with the need for accurate identification of clinical features following the exclusion of other disorders. Recent criteria developments have aimed to streamline the diagnosis and include the Rotterdam criteria, which requires two of three features and excludes other diagnoses. The pathophysiology includes excessive androgen secretion and insulin resistance, which aggravates symptoms. Hyperandrogenism may result from ovarian and adrenal overproduction of androgens, further complicated by insulin resistance, leading to metabolic consequences. Differentiating PCOS from similar endocrine disorders is crucial for accurate diagnosis. Current recommendations suggest assessing biochemical hyperandrogenism and irregular menstrual cycles as key indicators. In summary, PCOS is a multifaceted condition characterized by significant variability influenced by genetics and lifestyle, necessitating comprehensive care for affected women. The fluctuating diagnostic criteria reflect ongoing research to solidify a standard for effective identification and management of this syndrome.

Index Terms – Polycystic ovary syndrome; hyperandrogenism; insulin resistance, diagnostic criteria

Introduction

Polycystic ovary syndrome (PCOS) is the most common chronic reproductive and metabolic endocrine disorder affecting women of childbearing age with ovulation disorder, hyperandrogenism, and polycystic ovarian morphology (PCOM). An Estimate of 4%-21% of PCOS cases are found worldwide. Most people who experience these conditions are obese and have a high body mass index from the age limit of 18 to 39 years with a clinical history of Ovulation dysfunction, Hyperandrogenism, and Menstrual abnormalities. Well compared to the general female population, PCOS patients have high rates of adverse reproductive, cardiovascular, psychological, Metabolic and neoplastic outcomes. ^(1,2,3,8)

The pathogenesis of this disease is complex, multi-factorial, and not fully elucidated, thus, diagnosis relies on identifying features of the syndrome following the exclusion of known disorders affecting ovulation or hyperandrogenism. The diverse and varying features associated with this syndrome have resulted in the proposal of several diagnostic criteria for this disease dating back to 1935 when first described by Stein and Leventhal. Ideal diagnostic criteria will have optimized sensitivity and specificity, ensuring confidence in the criteria's ability to identify affected and unaffected individuals. However, the development of such a definition requires agreement on a gold standard for disease classification, assumes technology used for the

diagnosis will not change, and relies on the accurate evaluation of criteria components. Unfortunately, the diagnosis of PCOS has been challenged by all three of these pillars. This scholarly review seeks to elucidate the historical progression of the diagnostic criteria about Polycystic Ovary Syndrome (PCOS) throughout the years and to furnish a comprehensive overview of the most current criteria suggested for the diagnosis of this complex syndrome.⁽⁶⁾

The clinical indications in women with PCOS are diverse and complicated. Diagnosing PCOS and detecting its various manifestations are valuable for lifelong health care in affected women. Ovulation dysfunction raises the risk of infertility, menstrual irregularity, and abnormal uterine bleeding. Women with PCOS possess unique follicular development, which is an upstream factor of ovulation. A previous study proposed that follicular development in PCOS is characterized by both increased initial recruitment of primordial follicle growth and mature arrest in the antral stage, which subsequently accumulates small antral follicles in the ovaries and causes PCOM. Accumulated antral follicles are merely stalled in their growth; the follicles can restart growth once an iatrogenic FSH increment is initiated for ovulation induction and ovarian stimulation.⁽⁷⁾

PCOM is a serious problem in infertility treatment because it is directly associated with multiple pregnancies and ovarian hyperstimulation syndrome. Hirsutism, acne, seborrhoea, and female pattern hair loss are consequences of hyperandrogenism. Such skin manifestations can lead to psychosocial problems. Obesity is associated with various manifestations of Polycystic Ovary Syndrome (PCOS), notably insulin resistance and heightened androgen concentrations. Furthermore, females diagnosed with PCOS frequently encounter mental health challenges, including anxiety, depression, sleep disruptions, and disordered eating behaviors, in addition to the risk of developing endometrial tumors and experiencing complications during gestation. Polycystic ovary syndrome is regarded as a multifactorial condition characterized by significant variability. Genetic predisposition, environmental conditions, cultural differences, and dietary habits determine the body composition and modify the various symptoms of PCOS.⁽⁷⁾

2.0. CAUSES OF PCOS

Various external, environmental, and internal factors cause PCOS.

2.1 EXTERNAL FACTORS

2.1.1. GENETIC MECHANISMS

The gene types implicated in the development of PCOS are classified as follows: genes involved in the steroidogenesis of the ovary and adrenal glands, genes involved in the actions and regulation of steroid hormones, genes involved in the action and secretion of insulin, genes affecting energy homeostasis, and genes implicated in chronic inflammation. Thus, some particular alterations in some genomes are the reason for the development of PCOS. Some examples of genes involved in the development of PCOS are Calpain 10 (CAPN10), Cytochrome p450, Insulin gene, Androgen Receptor (AR), Fat Mass Obesity (FTO), and Follicular stimulating hormone receptor (FSHR).⁽⁷⁾

2.1.2. ENVIRONMENTAL FACTORS

Exposure to Endocrine Disrupting Chemicals (EDC) may also play a role in the development of PCOS. The Endocrine Society defines Endocrine Disrupting Chemicals as “an exogenous chemical, or mixture of chemicals, that interfere with hormonal action.” These chemical substances can affect the endocrine system and result in adverse effects. Endocrine-disrupting chemicals (EDCs) include substances such as bisphenol A (BPA), perchlorate, dioxins, phthalates, phytoestrogens, polychlorinated biphenyls (PCB), polybrominated diphenyl ethers (PBDE), triclosan, perfluoroalkyl, and poly-fluoroalkyl substances (PFAS), as well as pesticides like dichlorodiphenyltrichloroethane (DDT) and its metabolite dichlorodiphenyldichloroethylene (DDE), organophosphorus compounds, alkyl phenols (surfactants), parabens, methoxychlor, diethylstilbestrol (DES), the fungicide vinclozolin, and various natural hormones. EDCs work as agonists or antagonists by binding to hormone receptors and leading to increase, decrease, or prevent the activity of the hormones. Inflammatory mediators may rise in women exposed to air pollution, changing normal steroidogenesis and leading to the development of PCOS.⁽⁷⁾

2.1.3. DIET

A diet rich in fat, mainly saturated fatty acids, and intake of foods with a high glycaemic index increases the risk of insulin resistance and its related complications including obesity and PCOS.

2.2. INTERNAL FACTORS

2.2.1. INSULIN RESISTANCE: PCOS is frequently characterized by insulin resistance and compensatory hyperinsulinemia. Some studies indicate that hyperinsulinemia contributes to the hyperandrogenism of the condition by raising ovarian androgen production and impairing ovulation. This is the effect of insulin-inducing ovarian cells, called theca cells, that are responsible for androgen biosynthesis to produce testosterone.

2.2.2. HYPERANDROGENISM: Hyperandrogenism is attributable to ovarian dysfunction and insulin resistance, which obstruct the development of ovarian follicles, the maturation of oocytes, and the regularity of ovulation.

2.2.3. INFLAMMATION: The dysregulation of pro-inflammatory and anti-inflammatory cytokines, in conjunction with variations in cytokine genes, may contribute to the pathogenesis of Polycystic Ovary Syndrome (PCOS). As a result, the inflammatory response acts as a mediator in the exacerbation and advancement of the metabolic components associated with PCOS. Adipocytes can augment the synthesis of anti-inflammatory mediators, thereby fostering a state of chronic inflammation. Inflammation directly promotes the excess production of androgen in the ovaries. The level of hyperandrogenism may affect the emergence of abnormal fat, contributing to the inflammatory burden in PCOS. Studies have associated increased androgen levels with inflammation.

2.2.4. OBESITY: Obesity activates the theca cells that stimulate luteinizing hormones, which leads to ovarian androgen excess. High androgen levels lead to improper periods and obesity ⁽⁹⁾.

3. PATHOGENESIS

Excessive adrenal androgen secretion and/or ovarian secretion are the characteristics of PCOS. The overproduction of ovarian androgen is caused by both intrinsic ovarian factors such as altered steroidogenesis and external factor such as hyperinsulinemia. Theca cells in the ovary support developing follicles physiologically, aiding in the production of mature oocytes. Patients with PCOS experience ovarian hyperthecosis due to the hyperresponsiveness of theca cells to stimulatory actions of insulin. The symptoms of PCOS are exacerbated by insulin resistance in peripheral tissues, which increases the androgenic potential in theca cells. Another contributing factors to hyperandrogenism in PCOS is the heightened sensitivity of theca cells to activation by gonadal steroid gonadotrophins. Several factors, including changes in adipose cell activity, inflammatory factors, neuroendocrine function, metabolism, steroidogenesis, ovarian folliculogenesis, insulin production, and insulin sensitivity may have an impact on the pathophysiology of this illness.

3.1. ALTERNATION IN INSULIN SECRETION

Alteration in insulin secretion and insulin action leads to insulin resistance and hyperinsulinemia. An alteration in the secretion of gonadotropin-releasing hormone induces an elevation in the secretion of luteinizing hormone. The ovaries produce an excess of androgen due to malfunction in androgen synthesis. Insulin interferes with every aspect of the hypothalamus-hypophysis-ovary axis. Insulin resistance decreases metabolic signalling but maintains mitogenic and steroidogenic activity, which promotes hyperandrogenism. This appears to be the primary pathophysiologic mechanism behind PCOS development.

3.2. INSULIN RESISTANCE HYPERINSULINEMIA

The pathophysiology of insulin resistance in PCOS involves an interaction of non-heritable intrauterine and extrauterine environmental factors, genetic influences, and alternate responses to excess energy. Several molecular processes, including elevated free fatty acids, elevated cytokine secretion, elevated testosterone, and impaired post-receptor insulin function, are responsible for insulin resistance in PCOS. Insulin resistance (IR) is a metabolic condition marked by a reduction in cellular reactivity to insulin signalling and seems to be a necessary pathophysiologic mechanism in the development of any PCOS metabolic consequence. Women diagnosed with polycystic ovary syndrome (PCOS) commonly exhibit insulin resistance and elevated levels

of insulin. The onset of type 2 diabetes mellitus and impaired glucose tolerance are two metabolic disorders that manifest in women afflicted with PCOS.

Hyperinsulinemia associated with insulin resistance leads to the thickening of theca cells in ovaries, which causes anovulation and infertility. Insulin stimulates the corresponding trophic hormones to encourage steroidogenesis in steroidogenic organs like the ovary and the adrenal cortex. Hyperinsulinemia is the main cause of excessive ovarian or adrenal androgen secretion as it stimulates the action of LH. Additionally, hyperinsulinemia lowers the production of sex hormone binding globulin (SHBG), an essential protein in the bloodstream that regulates testosterone levels, leading to a rise in the concentration of free circulating testosterone⁽³⁾

3.3. ABNORMAL ANDROGEN SECRETION / HYPERANDROGENISM

Hyperandrogenism is the excess production of androgens, which are members of the steroid hormone family produced by the adrenal and ovarian glands. The abnormal production of androgens leads to the development of primordial follicles and an increase in antral follicles during the early gonadotrophin stage. The pituitary gland secretes gonadotropin hormones as a reaction to the hypothalamus synthesizing gonadotropin-releasing hormones (GnRH). The luteinizing hormone (LH) exerts its influence by activating the LH receptor, thereby enhancing androgen biosynthesis within the ovarian theca cells. Concurrently, the follicle-stimulating hormone (FSH) activates the FSH receptor in ovarian granulosa cells, facilitating the conversion of androgens into estradiol, which is instrumental in the development of new ovarian follicles. In the context of polycystic ovary syndrome (PCOS), the hypothalamic-pituitary-ovarian (HPO) axis exhibits imbalances that arise from the dysregulation of the neuroendocrine system, ultimately resulting in an overproduction of gonadotropins. An elevation in GnRH levels prompts the organism to synthesize a greater quantity of LH relative to FSH, leading to a significant increase in the LH: FSH ratio. Because of increased LH stimulation, theca cells in the ovaries undergo hyperplasia. Additionally, follicular fluid accumulates and forms cystic structures along the periphery, giving the appearance of a string of pearls. This occurs primarily in the prenatal and antral stages, when many follicles in the theca cells of ovaries become stopped. The overproduction of androgens occurs because of an increase in follicles and the expression of vital enzymes involved in androgen synthesis [36]. The abnormal release of the gonadotropins LH and FSH, which controls ovarian steroid production, follicle development, and ovulation, is significant in the development of PCOS. Women with PCOS have been known to exhibit enhanced LH pulse frequency and/or amplitude, elevated circulating LH levels, elevated LH: FSH ratios, and comparatively lower FSH levels [37]. Insulin-resistant hyperinsulinemia synergizes with androgen to prematurely luteinize granulosa cells, increases adipogenesis, and acts on theca cells to intensify hyperandrogenism. Excessive LH is triggered by increasing hyperandrogenism that acts on theca and luteinized granulosa cells to worsen hyperandrogenism.

3.4. DECREASED SEX HORMONE BINDING GLOBULIN (SHBGs)

Sex hormone-binding globulin (SHBG), a glycosylated homo-dimeric plasma transport glycoprotein made by hepatocytes, binds to sex hormones and regulates their levels in the bloodstream. Through the management of their metabolic clearance rates, it controls the bioavailability of testosterone in plasma. One important factor influencing the ability of sex steroids to enter target tissues and be metabolically cleared is their content of SHBG. SHBG receptors (RSHBG) can be found in tissues and cells that rely on sex steroids, which include the endometrium, prostate, colon, hypothalamus, breast, placenta, liver, epididymis, immune system, and heart muscle cells. SHBG levels are a good indicator of insulin resistance because they are decreased in insulin resistance. The abnormally lower production of SHBG levels causes hyperandrogenic symptoms such as virilization, acne, hirsutism, and androgenic alopecia. Several studies have demonstrated that reducing insulin resistance will eventually lead to a decrease in androgens and an improvement in the illness state

4. DIFFERENTIAL DIAGNOSIS

Polycystic Ovary Syndrome (PCOS) is a common endocrine disorder affecting roughly 8%–13% of women within the reproductive age range, with variations across different populations. The diseases go undiagnosed in as many as 70% of women due to the lack of clear and consistent guidance for diagnostic procedures for healthcare professionals. Over the past few decades, studies have investigated the unique traits present in women with PCOS, resulting in the establishment of three diagnostic criteria based on these identifying characteristics.

As outlined in the internationally accepted consensus guidelines, this endocrine disorder has three notable characteristics: ovulatory irregularities, elevated androgen levels, and polycystic ovarian morphology.⁽³⁰⁾ Furthermore, PCOS usually shows symptoms including excessive hair growth, irregular menstrual periods or absence of menstruation, infrequent ovulation, and difficulties with conception. Due to the diverse characteristics, three sets of diagnostic criteria have been developed throughout the years. The requirements are outlined below:⁽³⁾

The Rotterdam criteria is the most widely used criteria for diagnosing PCOS. According to the Rotterdam criteria, a diagnosis of polycystic ovarian syndrome is made when at least 2 of the following 3 criteria are satisfied, and other potential diagnoses are ruled out.⁽²⁷⁾ Since PCOS is classified as a diagnosis of exclusion, diagnostic tests are necessary for individuals showing symptoms, even if the test results may appear normal.⁽²⁹⁾ Recommended investigations are listed in Box 1. An analysis of the test results can be found in box 2. If a patient has an additional condition such as hypothyroidism, that condition must be prioritized, and the patient should be reassessed to determine if they have PCOS. Society, in 2006, views hyperandrogenism as the core disorder of PCOS and considers it a necessary condition for diagnosis, alongside one of the other Rotterdam criteria.

Box 2: Rotterdam criteria¹

Polycystic ovarian syndrome is diagnosed when 2 out of 3 of the following criteria are met and other diagnoses are excluded:

- Irregular cycles (if > 3 yr post-menarche, > 35 d apart or < 21 d apart; < 8 menstrual cycles per year; or > 90 d for any 1 menstrual cycle)
- Clinical hyperandrogenism (acne, hirsutism, alopecia) or biochemical hyperandrogenism
- Polycystic ovarian morphology on transvaginal ultrasonography or high antimüllerian hormone*

*Only applicable if patient is at least 8 years from menarche.

Box 3: Suggested initial investigations for patients presenting with menstrual irregularities or clinical hyperandrogenism

Tests should be completed in early follicular phase (day 2–4) in non-amenorrheic patients

- Prolactin
- Thyroid-stimulating hormone
- Luteinizing hormone, follicle-stimulating hormone and estradiol
- β -human chorionic gonadotropin (β -hCG)
- 17-hydroxyprogesterone (17-OHP)
- Total testosterone, calculated free testosterone or free androgen index with or without androstenedione, dehydroepiandrosterone sulfate
- Transvaginal ultrasonography or antimüllerian hormone*

*Optional if clinical criteria are not met; antimüllerian hormone used as an alternative to transvaginal ultrasonography, but should not be used in adolescents.

Box 1 and 2: PC: Ebernella Shirin Dason MD., Olexandra Koshkina MD MSc., Crystal Chan MD MSc, Mara Sobel MD MSc. (2024). Diagnosis and management of polycystic ovarian syndrome. MAJ 2024 January 29; 196: E85 -94.

Using this criterion for diagnosis facilitates the further categorization into four distinct phenotypes labeled A through D:

Phenotype A—Hyperandrogenism + Ovulatory Dysfunction + PCOM

Phenotype B—Hyperandrogenism + Ovulatory Dysfunction

Phenotype C—Hyperandrogenism + PCOM

Phenotype D—Ovulatory Dysfunction + PCOM

The Rotterdam criteria are commonly utilized by gynaecologists, obstetricians, and other healthcare professionals; they were also incorporated into the 2018 International PCOS guidelines and various other guidelines. Additionally, these criteria were recommended by the NIH's evidence-based PCOS workshop convened in 2012, which emphasized the importance of phenotype identification in all research.^(3,4) In addition to the Rotterdam criteria, there are two other definitions for PCOS. There are different diagnostic criteria used to identify PCOS, their comparison, and evaluation.

The Androgen Excess Society, in 2006, views hyperandrogenism as the core disorder of PCOS and considers it a necessary condition for diagnosis, alongside one of the other Rotterdam criteria.

The National Institutes of Health (NIH) criteria introduced in 2009 require the identification of either clinical or biochemical hyperandrogenism along with chronic ovulatory dysfunction. It's important to distinguish between other clinical conditions that also produce androgens, like Cushing's syndrome, congenital adrenal hyperplasia, and tumors. AE-PCOS Criteria, introduced in 2006 by the Androgen Excess

and PCOS Society, states that the presence of hyperandrogenism alongside one or two additional factors (such as ovulatory dysfunction and/or the presence of polycystic ovarian morphology) is adequate for a diagnosis of PCOS.

Table 1. Diagnostic criteria.

Diagnostic criteria	Rotterdam (2003)	National Institutes of Health (NIH, 2009)	Androgen Excess Society (2006)
Hyperandrogenism	Yes	Yes	Yes
Exclusion of other androgen excess causes	No	Yes	No
Ovulation disorders	Yes	Yes	No
Ovarian dysfunction (oligoovulation, anovulation) and/or presence of polycystic ovaries on ultrasound	No	No	Yes
Cysts on one ovary or an ovarian volume exceeding 10 mL	Yes	No	No
Number of occurrences	2 out of 3	3 out of 3	2 out of 2

Table: 1: Natalia Anna Stańczaka.; Ewelina Grywalskab.; Ewa Dudzińskaa.(2024). The latest reports and treatment methods on polycystic ovary syndrome. *Annals of Medicine* 2024; VOL. 56: 1-21.

To summarize, the three diagnostic criteria facilitate the identification and measurement of the characteristic features of PCOS (hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology) necessary for a definitive diagnosis of the disorder. However, it is important to highlight that a diagnosis based on any one of these three criteria is only valid if other endocrine disorders such as hyperprolactinemia, thyroid dysfunction, non-classical congenital adrenal hyperplasia (NCAH), Cushing's syndrome/disease, hypogonadotropic hypogonadism, or androgen-secreting tumours, which can present similar clinical, biochemical, or morphological characteristics to PCOS are excluded^(3,29)

5. DIAGNOSTIC FEATURES IN ADULTS

5.1 HYPERANDROGENISM (BIOCHEMICAL & CLINICAL)

Hyperandrogenism is divided into two categories they are biochemical and clinical hyperandrogenism. About 60-80 % of women with PCOS are exhibit the biochemical androgenism. Biochemical androgenism identify using the following parameters total testosterone (TT), free androgen index (FAI), calculated free testosterone (fT), and/or calculated bioavailable testosterone.^(3,6,28)

CURRENT RECOMMENDATION

Biochemical hyperandrogenism is characterized by elevated levels of total or free testosterone, which should be assessed using high-quality methods like liquid chromatography mass spectrometry and extraction/chromatography immunoassays. To identify PCOS, free testosterone, free androgen index, or bioavailable testosterone can serve as markers for hyperandrogenism. Furthermore, it might be beneficial to assess androstenedione (ANDS) and dehydroepiandrosterone sulfate (DHEAS) if total or free testosterone levels are not raised. It's important to interpret androgen levels using the reference ranges provided by the analysis laboratory.⁽⁷⁾

5.2 IRREGULAR CYCLES AND OVULATORY DYSFUNCTION

In normal pubertal women menstrual periods range from 21 to 31 days, with a relatively constant luteal phase lasting 14 days, and a more viable follicular phase length. Even among individuals who have regular ovulatory cycles, there is considerable variation, both across different people and within the same individual, regarding the overall length of their cycle, as well as the lengths of the follicular and luteal phases. In general, a surrogate marker for ovulatory function can be the presence of regular monthly menses that fall within this normal range.^(6,26,27)

However, it is normal, even for women with one or more anovulatory cycles per year can be achieved with consistent 28-day cycles. The most recent guidelines suggest using irregular menstrual cycle as a diagnostic for ovulatory dysfunction in these findings. Oligo amenorrhea or cycles that are more than 35 days apart or less than eight cycles in a year, is a common sign of menstrual disruption in PCOS patients.^(6,24,25)

Menstrual dysfunction among patients with PCOS is typically characterise oligomenorrhea (cycles >35 days apart or <8 cycles per year). Polymenorrhea (cycles occurring < 21 days apart) is uncommon among patients with PCOS. Nonetheless, certain guidelines for diagnosing PCOS have incorporated this feature. Regardless, if there is a strong clinical suspicion for PCOS in a patient with regular menstrual cycles, polymenorrhagia or an unclear menstrual pattern, additional assessment of ovulation should be confirmed with serum progesterone, given the possibility of ovulatory dysfunction with classic oligo-amenorrhea. Although it's beyond the focus of this review, it's crucial to emphasize that this suggestion is meant solely for adults. In the first year after menarche, irregular menstrual cycles are typical, and during the following 1 to 3 years, irregular menstruation is defined as cycles occurring less than 21 days or more than 45 days apart.⁽⁷⁾

CURRENT RECOMMENDATION

Oligo-amenorrhea, defined as cycles that are more than 35 days apart or fewer than 8 cycles annually, may serve as an indicator of ovulatory dysfunction for diagnosing PCOS. For those with an ambiguous menstrual history, ovulation can be verified through serum progesterone testing or luteinizing hormone assessment.^(7,22,23)

5.3 POLYCYSTIC OVARIAN MORPHOLOGY

PCOM is recognized as the most widely used feature in the diagnosis of PCOS. It was first introduced in the Rotterdam criteria as the third feature of PCOS in 2003.¹¹ However, this diagnostic criterion is debatable due to the lack of homogeneity in the results regarding its implementation, and its non-applicability for females above the gynaecological age of 8 years. Therefore, it has been deemed a non-essential feature in the presence of the remaining two criteria.^(3,20,21)

The ovulation process is halted due to follicular arrest in women with PCOS. The small follicles appear as cyst-like formations on transvaginal ultrasound. Initially, the Rotterdam criteria set the threshold for identifying polycystic morphology at 12 or more follicles per ovary (FNPO), with each measuring between 2 and 9 mm or an ovary with a volume of 10 cm³ on a transvaginal scan. The FNPO, an essential measure, was subsequently revised in line with technological advancements that allowed for enhanced imaging. With the use of a high-resolution transducer frequency of 8 MHz or greater, an FNPO of 20 or more for the same-sized follicles (2–9 mm) and an ovarian volume of 10 cm³ for adult women was endorsed by a global consensus on evidence-based PCOS guidelines in 2018. The volume of the ovaries is crucial when FNPO/Antral Follicle Count (AFC) is difficult to ascertain due to technical issues in imaging, such as in the case of transabdominal ultrasound. A transvaginal ultrasound is the preferred method for assessing FNPO indicative of polycystic ovaries. Nevertheless, it should only be utilized in sexually active women.^(3,17,18)

Patients need to be informed that cysts are simply immature follicles, which is a typical characteristic seen in all ovaries; it is the quantity of follicles present that signifies polycystic ovarian morphology. When polycystic ovarian morphology is found unexpectedly, the clinician should investigate the patient's history for irregular menstrual cycles, acne, hirsutism, and hair thinning. Furthermore, a targeted laboratory evaluation for biochemical hyperandrogenism might be recommended.^(1,19,20)

5.4 ANTI- MULLERIAN HORMONE (AMH)

AMH is a polypeptide secreted by granulosa cells of preantral and small antral follicles. Levels of AMH are significantly higher among those with PCOS AMH being proposed as an alternative marker for diagnosing PCOS. Given the uncertainty surrounding the effectiveness of ultrasound for diagnosis, AMH has been suggested as a viable method for identifying polycystic ovarian morphology (PCOM). There is a recognized positive relationship between AMH levels and the count of antral follicles in women diagnosed with PCOS. This is due to AMH being produced by the granulosa cells within ovarian follicles (specifically pre-antral and antral), which are often found in higher numbers in individuals with PCOS. Although AMH shows potential as a valuable diagnostic indicator, it has not been widely adopted as a standard element in the diagnosis of PCOS because of the lack of standardized cut-off values and the variability observed across different studies.^(9,15,16)

6. CONCLUSION

Polycystic Ovary Syndrome (PCOS) is a complex and multifaceted endocrine disorder that affects a significant proportion of women of childbearing age worldwide. The disorder is characterized by

unpredictable ovulation, high levels of male hormones, and the existence of multiple cysts on the ovaries, often connected to obesity, insulin resistance, and an elevated body mass index. The onset of PCOS is associated with greater production of androgens and insulin resistance, which exacerbates the condition and increase the risk of complications related to reproduction, cardiovascular health, mental well-being, metabolism, and cancer. Accurate diagnosis of PCOS is crucial, and the Rotterdam criteria provide a standardized approach to diagnosis, requiring the presence of two of three key features alongside the exclusion of other diagnoses. This literature review emphasizes the importance of a thorough understanding of PCOS, including its causes and methods for diagnosis, to facilitate prompt and effective management of the condition, which will ultimately enhance the quality of life for women impacted by PCOS.

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