International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

"Polycystic OvarySyndromeinAdolescents: Aninsightreview"

Pratiksha Pandey[1], Dr. Kalpesh Patel[1], Vikas Maurya[2]*
1. Department of Pharmaceutics, Government Pharmacy College, Surat, Gujarat, India
2. Department of Pharmaceutics, Bhagwan Mahavir College of Pharmacy, Surat, Gujarat, India.

Date of Submission: 15-12-2025 Date of Acceptance: 25-12-2025

ABSTRACT:
PCOS, affecting 6-15% of reproductive-age women, is a hormonal disorder with diverse symptoms such as hirsutism, irregular menstrual cycles, and obesity. Diagnostic criteria like NIH, Rotterdam, andAndrogen Excess-PCOS Society consider factors such as hyperandrogenism,chronicanovulation,andpolycystic ovarymorphology. Hirsutism,acne,and seborrhea are common, but alopecia is rare in adolescents. PCOS, found in both normal-weight and overweight women, worsens with obesity, leading to metabolic and cardiovascular complications. Complex pathophysiology involves hormonalimbalances and insulin resistance. Diagnosing PCOS in adolescents is challenging, with limited imaging techniques. Global prevalence ranges from 2.2% to 26%, with higher rates in Indian women. PCOS is linked to diabetes, cardiovascular risks, and gynecological cancers. Early detection and management are crucial to mitigate long-term health risks
Keywords: PCOS, adolescents, hormonal disorder, irregular periods, androgen levels, polycystic ovaries, puberty, diagnosis, lifestyle modifications, diet, exercise, management, healthcare, complications, research, treatment strategies.

I. INTRODUCTION

Polycysticovarysyndrome(PCOS),also knownasStein-LeventhalSyndromeitisa disorderthatstemsfromhormonalimbalancecombine dwithgeneticandenvironmentalfactors.[1] It affects estimated 6-15 % of women of reproductive age and accounts for 72-84 % of adult hyperandrogenism.[2-4]it is a prevalent endocrine and metabolic disorder affecting 6–20% of Women of childbearing age.[5,6] it is one of the most frequently mentioned causes of infertility accountingforUpto56%ofcases.[7,8]AlthoughtheContributionofgenesisestimatedtobe72%, the genetic loci that have so far been identifiedAs determining the occurrence of this syndrome account for only about 10%.[9,10] It presents with a variety of symptoms such as mild hirsutism, hyperandrogenism, oligomenorrheaordysfunctionaluterinebleedingand obesity.[11,12] In the youngest women, it is Manifested by puberty and menstrual disorders, as well as cosmetic attributes associated With hyperandrogenism. At a later age, problems with ovulation and infertility dominate, followed by metabolic disorders. PCOS is linked to an increased risk of diabetes, Dyslipidemia ,cardiovascular disease, and fatty liver, as well as a higher risk of cancer, Autoimmune diseases, and mental disorders[13,14,15]Three worldwide conferences have developed Somewhat distinctive but covering demonstrative criteria For adult women: the National Institutes of Health (NIH) Conference criteria (1990), the Rotterdam consensus Criteria (2003) (Rotterdam ESHRE/ASRM-Sponsored PCOS ConsensusWorkshop Group 2004),and the Androgen Excess-PCOS Society consensus criteria (2006).[16,17,18]The NIH criteria included hyperandrogenism, Chronic anovulation, and avoidance of other causes of these indications.[1s6]TheRotterdamcriteriaaretheBroade standincorporatethehighlightsoftheother definitions. They permit PCOS to be analyzed with a combination of Chronic anovulation and polycystic ovary morphology (PCOM) without hyperandrogenism. [19-23]

1.1 ETIOLOGY:

Forthemostpart,PCOSappearstobeacongenitalconditionthatisfirstdiagnosedduringadolescence [24,25]AccumulatingevidenceindicatesthatPCOS arises asacomplextrait influenced by hereditary and

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

non-hereditary factors.[26] Familial clustering of cases suggested a genetic basis forthedisease [27,28] Manygenesaresaidtobedirectlyorindirectlypromotet heprogressionofthe disease. But not now a penetrant gene was identified.[29]Themostimportantgenestoconsiderwit hintheetiologyofPCOSincludeCYP11A1,CYP17A1 , andCYP19A1. PCOSpatientshaveelevatedserumLHlevels,whichsti mulatesteroidogenesisin androgen-producingthecalcells.Steroidogenesisistheprocessby whichcholesterolismadecells of steroidogenic-specific organs are converted into bioactive compounds. The process is steroidogenicenzymesincludingsteroidreductasessu chashydroxysteroiddehydrogenase(HSD) andcytochrome P450 (CYP) family enzymes. In the ovaries,cholesterol is converted to pregnenolonebyCYP11A1underinfluenceofthelutei nizingHormone(LH).pregnenolone,onhe other hand, is first hydroxylatedto 17-hydroxypregnenolone before being converted to dehydroepiandrosterone (DHEA) by CYP 17A1[30]. Ahigh-calorie diet and a sedentary lifestyle can be possible causes of worsening PCOS.Ahigh- sugar diet can contribute to PCOS by altering gut microflora, causing chronic inflammation, increasinginsulinresistance,andincreasingandrogen production.obesityandweightgainworsen the symptoms of this syndrome. Compared with high glycemic index (HGI) diets, low GI (LGI) dietsreducedfastinginsulin,totalandLDLcholesterol, TGvalues,waistcircumferenceand total testosterone without changing fasting glucose, HDL cholesterol, body weight orfree androgen index in PCOS. Patients. [31,32]. Several studies have shown that environmental pollutants such as heavy metals, insecticide, and endocrinedisruptingchemicals(EDCs)significantlya ffecthumanhealthandreproductionIndeed, thereisincreasingevidencethatenvironmentalpolluta ntsplayaroletodevelopPCOS.Takeuchi andKandarakietal.foundthatserumBPAconcentratio nsinhyperandrogenicwomenwithPCOS were higher than in non-hyperandrogenic womenwith PCOS and healthy controls [33,34]. A separatestudy found thatitis increasing blood BPAlevelswerepositively associated with serum testosterone levels in PCOS women compared to healthy women. Explains the relationships between different environments pollutants and PCOS, Vagi. conducted a case-control study that showed higher serum levels of perfluorooctanoate and perfluorooctanesulfonate in women with PCOS.[35]

1.2 EPIDEMIOLOGY:

ClearlythepredominanceofPCOSwilldepen dtoadegreeonthecriteriautilizedto define This clutter. The predominance of PCOS has been decided in different populations, primarilyofWhiteorCaucasianand,inoneponder,ofD arkraces.Inathinkabout of277womenlookingforapre-employmentphysicalinacollegewithinthesoutheaster nUS, we initially detailed an in general predominance of PCOS analyzed by the NIH 1990 criteria of 4.0%,with no noteworthy distinction between Whites and Blacks[82]consequent and more seriously think about of 400 unselected continuous ladies matured 18–45 a long time in the same setting (223 Dark, 166 White, and 11 of other races), the predominance of PCOS was watched to be 6.6%, and still not essentially distinctive between Blacks and Whites(8.0 and 4.8%, separately)[36]. PredominanceestimatesforPCOS,ascharacterizedby theNIH/NICHD criteria,demonstrate that PCOS may be a common endocrinopathy affecting 4%–8% of ladies of regenerative age. Recently,afewgroupshaveillustratedthatthepredomi nanceofPCOSshiftsdependingon the symptomatic criteria utilized (see Table 1)

Table:1 Prevalenceofpolycysticovarysyndrome(PCOS)usingdifferentdiagnosticcriteria [37-40]

Source	Population	NIH/NICHD criteria	ESHRE/ASRM (Rotterdam) criteria	Androgen excess and PCOS society criteria
March et al	728 Australian women	8.7%	17.8%	12.0%
Mehrabian et al	820 Iranian women	7%	15.2%	7.92%
Tehrani et al	929 Iranian women	7.1%	14.6%	11.7%
Yildiz et al	392 Turkish women	6.1%	19.9%	15.3%

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

II. PATHOGENESIS:

The Pathogenesis of PCOSincludes essential theca cell defects [41]as well as neuroendocrine dysfunction of the hypothalamic-pituitary-ovarian axis leading to hyperandrogenemia [42]. The pathophysiology of these conditions influenced by alterations in steroidogenesis, ovarian folliculogenesis, neuroendocrine function, metabolism, insulin production, insulin sensitivity, adipose cell activity, inflammatory factors, and sympathectomies function [43]. Androgen excess, observed in approximately 60–80% of patients with PCOS, is a key feature of the disorder. Hirsutism and hyperandrogenism are manifestations of the excessive androgen production. Indeed, hyperandrogenism, commonly demonstrated by elevated free(unbound) testosterone in circulation, is the most common abnormality observed in the syndrome and plays a major role in perpetuating the aberrant hormone contributors to the pathophysiology of PCOS. Excessive ovarian androgen production is present in the majority of cases, but excessive adrenal androgen productioncanoccuramongsome.Theelevatedandrogenconcentrationssuppresssex hormonebindingglobulin(SHBG)concentrationscontributingtohigherfreetestosterone concentrations [44]

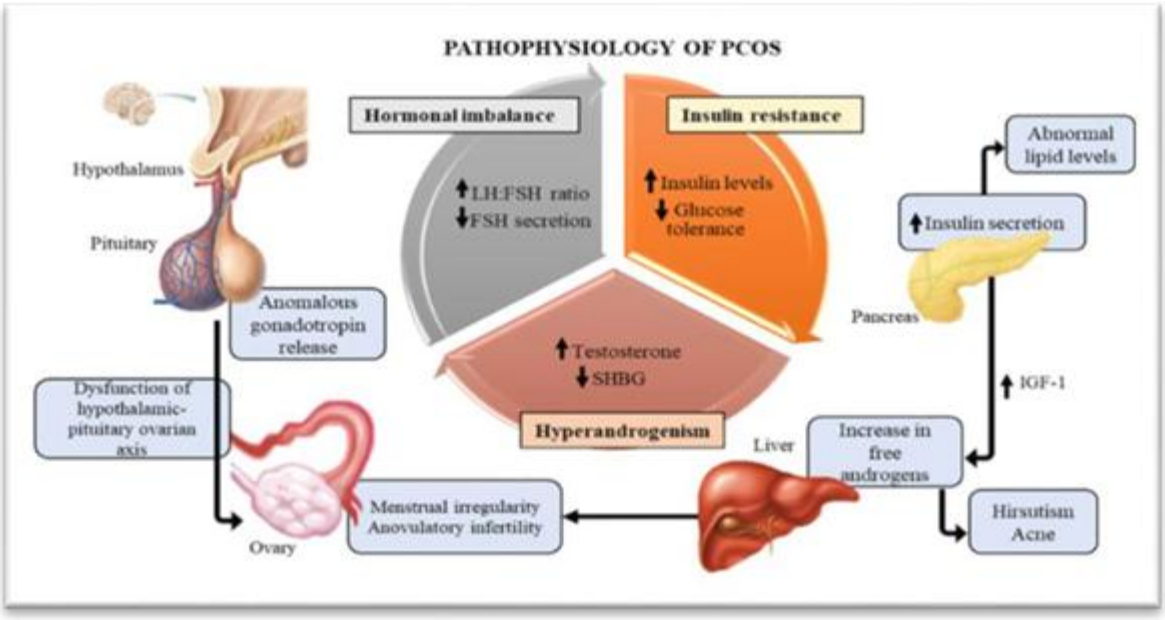

Fig:1PathogenesisofPCOS

2.1 InsulinresistanceinthepathogenesisofPCOS:

The role of insulin resistance in the pathogenesis of PCOS is supported by observations thatimprovinginsulinsensitivityinthiscondition(throughweightlossordrugtherapy)improves reproductive, hyperandrogenic and metabolic features. [45] The Following interaction with its receptor,intracellulareffectsofinsulinfollowtwo main pathways via:(i)phosphatidylinositol3-kinase (PI3-kinase) and (ii) mitogen-activated protein kinase (MAP kinase). Each of these pathways mediates disparate cellular effects of insulin stimulation. The PI3-kinase pathway mediates metaboliceffects (including glucose disposalinto skeletal muscle) and theMAPkinasepathwaymediatescellgrowthand steroidogeniceffects.[46]InPCOS,itappearsthat onlythePI3- kinase pathway is dysfunctional, with the MAP kinase pathway functioning normally. [47] The result is divergent cellular responses to insulin, with resistance to its metabolic effects and concurrent enhancement of steroidogenesis manifesting as metabolic

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

dysfunction, hyperandrogenemia and reproductive dysfunction.[48]. TheintactMAPkinasereceptorpathwayisimportantinthemechanismbywhichinsulinresistanceinfluencesdevelopmentofhyperandrogenemiainPCOS.Inacomparisonbetweenurinarysteroid profilesinwomenwithPCOS(n=178)andBMI-matchedcontrolwomen(n=100),ourowngroup demonstrated enhanced 5α reductase activity associated with PCOS. Resulting enhanced conversionoftestosteronetothemorepotentandrogen,5α-dihydrotestosteronelikely contributes to the hyperandrogenism of PCOS.

A further effect of enhanced 5α reductase activity is the breakdown of cortisol with reduced negative feedback at the pituitary. Consequently, the hypothalamo–pituitary adrenal axis becomes overactive in PCOS, thereby further stimulating adrenal androgen production [49]

2.2 GenesinvolvedinpathogenesisofPCOS:

GeneticfactorsinvolvedininheritancePCOS (Table2).However,thegreatheterogeneity ofdescribed genomes does Unequivocal determination ofPCOS genotype is not possible [50] althoughthecontributionofgenesisestimatedtobe72 %ofthegeneticlociidentifiedsofar,the detection rate of this syndrome is only about 10%[51,52].

Table 2: The main genes involved in pathophysiology of PCOS and their metabolic and fertility impact.[50]

Gens Involves in the Pathophysiology of PCOS				
Steroidogenesis	**Insulin Secretion and Action**	**Effect of Steroid Hormones**	**Gonadotropin Regulation**	**Others**
CYP21, CYP11a, CYP19, CYP17	*IRS* group, *INSR, CAPN10, FTO*	AR, SHBG, *DENND1A*	FSHR, *LHCGR*, AMH, *HOXA* group, BMP	PAI-1
Hyperandrogenism	Diabetes, obesity Oxidative stress	Hyperandrogenism	Infertility	Infertility
Ovulation and Implantation Disorders				
Infertility/Cycle Disorders				

CYP group: cytochrome family p450; *INS*: insulin gene; *IRSR*: insuline receptor substrate; *CAPN10*: caplain—10; *FTO*: fat mass obesity; AR: androgen receptor; SHBG: sex hormone binding globulin; *DENND1A*: connecdenn-1; FSHR: follicle-stimulating hormone receptor; *LHCGR*: lutein hormone gen receptor; AMH: anti-Mullerian hormone; *HOXA*: gen responsible for succsesful implantation; BMP: bone morphogenetic protein; PAI-1: plasminogen activator inhibitor 1.

ThemajorityStudiesshowthatthemechanismsthattriggerPCOSareduetoepigeneticchanges, Includingglycationofcertaingeneendproducts.Those aftertranslationthechangesdependon theenvironmentofthemotherorganism,whichismorea ndmorenumerousCivilizationalfactorsthatcauseobesity,as well as hormonalandimmunologicalfactorsDisordersassociatedwiththe pathogenesis of PCOS in the developing fetus (Figure 3) [53].

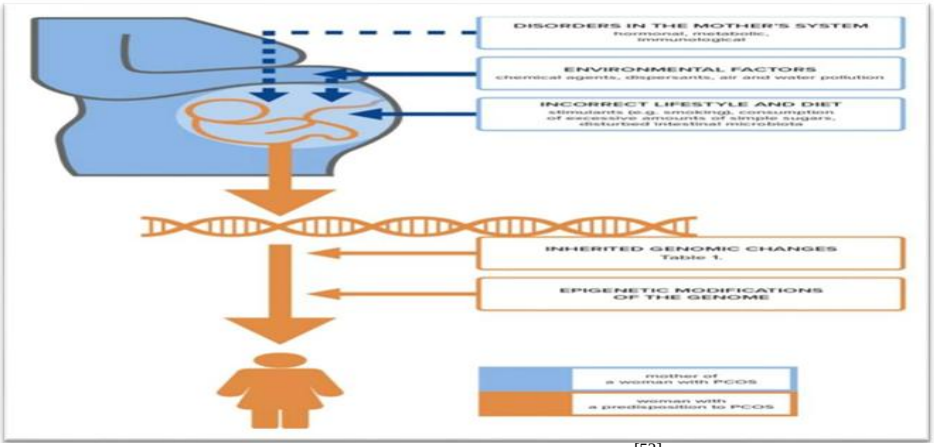

Fig:2GeneticvulnerabilitytoPCOS.[53]

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

Additionally, there is evidence of a genetically male counterpart to PCOS that rules it outthe starting point of this syndrome is the ovaries [54]. Men turned out to be tallwith genetic risk, the likelihood of developing the "male equivalent" of PCOSincreasedon the development of obesity, diabetes, cardiovascular diseases and male pattern baldness [55].It is possible that the reproductive problems associated with PCOS may be due to biological causesMechanisms common tomen and women [56].

III. DIAGNOSIS:

ThefirstdiagnosticcriteriaforPCOSinadultwomenwe reestablishedbyaconsensus meeting at the National Institutes of Health (NIH) in 1990 [57] Including NIH criteria clinicalorbiochemicalevidenceofhyperandrogenism andovulationdisorders[58].PCOM was not part of their criteria because it was already known at the time that polycystic ovarian morphologyis observed in 20–30% of healthy women [59]. the NIH criteria were the standard for diagnosing PCOSfor more than a decade until 2012when the NIH recommended theuseoftheRotterdamcriteria.TheRotterdamcriteria wereanotherstepforwardinthediagnosis ofPCOSbyaddingPCOMasadiagnosticcriterion. PCOSisdefinedaccordingtotheRotterdam Agreement twoof the following three criteria: oligo/anovulation, hyperandrogenism, and polycystic ovaries [60]

Table3: DifferencesincriteriaforPCOSdiagnosisinadolescentpatients. [61,62]

Criteria	Definition	
Menstrual Irregularity	Irregular menses/oligomenorrhea 2 years post-menarche. Menstrual cycles > 90 days 1-year post-menarche. Primary amenorrhea in girls with completed puberty.	Irregular menstrual cycles < 1-year post-menarche represents a normal pubertal transition. >90 days for any one cycle > 1-year post-menarche. Cycles< 21 or >45 days >1 to <3 years post-menarche. Cycles < 21 or >35 days 3 years post-menarche. Primary amenorrhea by age 15 or >3 years post-thelarche.
Hyperandrogenism	Evidence of hyperandrogenism: a. Biochemical—no clear testosterone concentration cut-offs; confirmation of biochemical hyperandrogenism in symptomatic adolescents. b. Clinical—hirsutism and/or moderate or severe inflammatory acne, especially if unresponsive to topical therapy.	Evidence of hyperandrogenism: a. biochemical—no clear testosterone concentration cut-offs; calculated free testosterone, free androgen index, or bioavailable testosterone evaluation with high-quality assays. b. clinical—hirsutism assessed with standardized visual scales e.g., the Ferriman–Gallwey scale and/or moderate or severe comedonal acne (i.e., 10 or more facial lesions), or moderate to severe inflammatory acne.
Polycystic Ovary on Ultrasound	The presence of PCOM in an adolescent who does not have hyperandrogenism/oligo-anovulation does not indicate a diagnosis of PCOS.	Pelvic ultrasound should not be used for the diagnosis of PCOS in those with a gynecological age of <8 years.

3.1 PolycysticOvaryonUltrasound:PCOM

The presence of enlarged ovaries with increased stroma and several small peripheral cystsknown as PCOM (Polycystic ovary morphology). PCOM is associated with hyperandrogenism,butnotalwaysincludedinthediagn osticpartofPCOS.PCOMisaninconsistentfindinginh ealthygirls[63]andadults,butthepersistenceofPCOM isgreater time is observed in hyper androgenic adolescents [64]in addition, the defining criteria for an ultrasound examination modification of thePCOS model is ongoing [65]. The anatomical appearance of the ovary changes with age[66]. Ovarian volume increases during pubertyandreachesadultnumbersintheyearsafterthe onsetofmenstruation.Itremainsstableand declines in young adulthoodafter the middle of the fourth decade of life.[67] Follicles size also changeswithageandmaximumamountduringpuberty smallfolliclesareobservedandasayoung adult, and thenumber of follicles decreases significantly read by age.[68]

AnultrasounddiagnosisofPCOMismadesta ndardizedforadultsusingthetransvaginalroute.In thecaseofyoungpeople,themajorityoftheexamsaresti llsuccessfulTransabdominalroutewith a high physiological follicle number can make follicle count an unreliable criterion to diagnose PCOM.ImportanceofuseappropriatediagnosticcriteriaforPCOMinyouthexistisemphasized becausetheapplicationofadultcriteriacanlead to afalsely elevated prevalenceof PCOM (30- 40%

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

region) [69,70]

Table4: SuggestedcriteriaforthediagnosisofPCOSinadolescence[71]

Required	Optional[a]	Not recommended[b]	Comments
1. Irregular menses/ oligomenorrhea 2. Evidence of hyperandrogenism: a. Biochemical b. Clinical (e.g., progressive hirsutism)	1. PCOM 2. Severe cystic acne	1. Obesity 2. Insulin resistance 3. Hyperinsulinemia 4. Biomarkers (e.g., AMH, T/DHT ratio) 5. Acanthosis nigricans	1. Must generally be 2 years post-menarche 2. Must rule out other disorders of hyperandrogenism (e.g., NC-CAH, Cushing syndrome)

PCOS; polycystic ovary syndrome; PCOM, polycystic ovarian morphology; AMH, anti-Müllerian hormone; T/DHT, testosterone to dihydrotestosterone; NC-CAH, non-classical congenital adrenal hyperplasia. [a] These criteria are often used in concert with the required criteria, but should not be used independently as diagnostic features. [b] These criteria have been associated with PCOS but are not diagnostic.

3.2 Menstrualirregularities:

One of the most important problems faced by healthcare providers in particular anovulatory dysfunction is diagnosed in primary care based on the irregular cycles of the adolescent. This has long been understoodThattheperiod between periods is accompanied by maturationHypothalamic-pituitary-ovarian (HPO) axis and period establishing aregular ovulation cycle. For this therefore, the average cycle for an adult can last 28 days (range 24-35). some time starts right after menstruation, with a significant difference in cycle length and a high ratioAnovulatory cycles, especially in the first year after menarche [72]Guidelines recommend considering PCOS based on cyclonic irregularityin the third year after menstruation.Atthispoint,95%ofcyclesfail21-45daysandperiodslast2-7days.Menstruation irregularities at this age have been shown to be highly correlated suffers from oligomenorrhea at the age of 18 years [73]Children can be especially overweight Tendency to premature pubic arch andpubicarchandinturnmaybemorepronetoprematurmenstruationandPCOS;Theyshould beconsideredahigh-riskpopulationandreceivesspecialattentionthecourse ofthepostmenstrual cycle[74,75,76]. BecausePCOSisadiagnosisofexclusion,thereareothercausesofirregularcycles (suchashypothyroidismorhyperprolactinemia)mustbeconsideredandruledoutbefore diagnosing PCOS.Astudy of menstrual disorders after two yearsirregular cycles seem to have become the norm worldwide [77,78,79].

IV. TREATMENTOFADOLESCENTPCOS:

Adolescents with pre-existing PCOS symptoms [80]often require treatment to manage their symptoms. For adolescents with a clear diagnosis of PCOS, treatment should include education about PCOS and lifestyle interventions. These interventions can be tailored to address themostcommoncomplaintsandsymptoms. Interventionsmayinclude: Metformin; Combinedoralcontraceptivepills(COCP);Spironolactone;localHirsutismandAcneTreatment.Managemento f Comorbid Conditions; regular Follow-Up; Planning for Transition toAdult Care Providers [81]

4.1 Oralcontraceptives(OCPs):

OCPsareatypeofmedicationthatcanbeusedasafirstlineoftreatmentforwomenwho areunabletoovulateduetomenstrualirregularities.Theyareavailableintwoforms:progesterone only pills and combined pills that contain both estrogen (estradiol dose up to 50µg) and progesterone (norethisterone, desogestrel) [82]. OCPs reduce the circulating androgen levels by increasing theSHBG (seeFig:6). [83] WomenwithPolycysticOvarySyndrome(PCOS)are morelikelytodevelopcancers,however,OCPsmayreducetheriskofovariancancer [84].OCPsarenotknowntoaffectinsulinresistance,however,theymaydemonstratevariabilityinlipidprofiles that may lead to metabolicdisorders [85].Therefore, OCPs should beused based on theriskgradeand should be discontinued immediately if any discrepancies are observed.

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

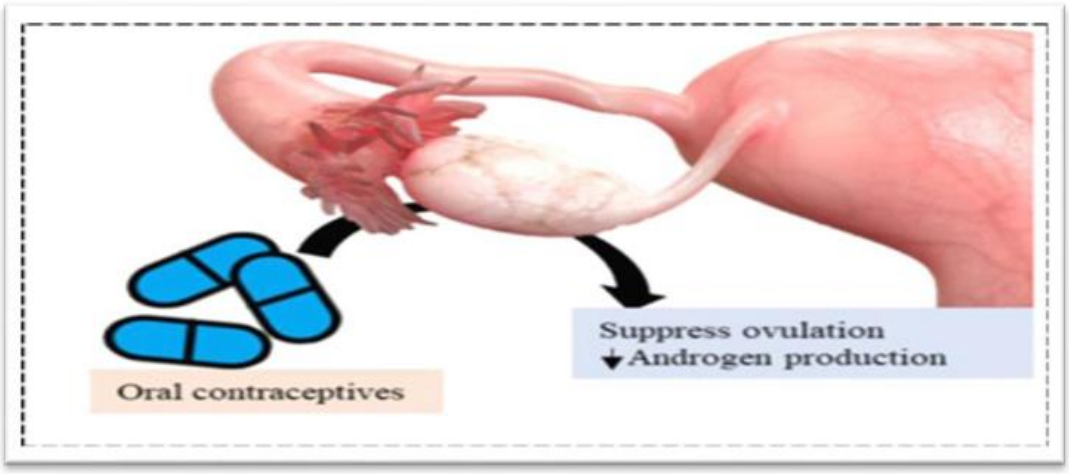

Fig:3.MechanismofOCPs.[86]

4.2 Antiandrogens:

Theuseofeffectiveformsofcontraception,including antiandrogens,maybeconsideredas atreatmentforhirsutismandandrogen-relatedalopecia.However,thepotentialteratogeniceffects ofantiandrogensonmalefetuses,aswellastheirinterferencewithexternalgenitaldevelopment, necessitate the use of effective contraception. This recommendation, based on a conditional evidence-based review with aGRADEof very low,was primarily madeinadultwomen and was based on the use of flutamide or finasteride, spironolactone's, alone or in conjunction with a diet intervention.[87] This group includes: Spironolactone ,Flutamide ,Cyproterone acetate Which reduces androgen secretion byinhibitionbyandrogenreceptorantagonistsandispreferredasthefirst-linedrugin hirsutismtreatment.[88] Spironolactoneisananabolicagentthatproducesanantiandrogeniceffect whentakenathighdoses.Whentakenalone,itleadstomorefrequentperiods,soitisusuallyused incombinationwithOCPstocreatesynergyandovercometheproblem.[89]Flutamideisanorally- tolerated anabolic agent used to treat prostate cancer and has the same efficacy as spironolactone in the treatment of hirsutism.[90,91,92] Flutamide is commonly used in conjunction with metformin due to its potential to cause hepatotoxicity when taken on its own. [93] Additionally, Cyproterone Acetate is a powerful antiandrogen with a progestogenic effect. When used in conjunction with Ethinylestradiol, it can beusedasatreatmentforacneandhirsutism.]Finasteride isaninhibitorof5-S-reductase,which has been shown to reduce hirsutism cores.However, its use in women is restricted due to its teratogenic properties. It is recommended for postmenopausal women and those who are unable to ovulate.[94]

4.3 Insulinsensitizers:

This class of medicinal products is typically utilized to address metabolic co-marks associated with Polycystic Ovary Syndrome (PCOS) by reducing insulin resistance and restoring insulin levels to a normal range. By reducing the Internal Repute Ratio (IR), the associated androgen levels will decrease, resulting in an improvement in menstrual cycles.[90]

4.4 Metformin:

Metformin has been shown to increase insulin sensitivity in liver by reducing the activity of gluconeogenic enzymes such as Pele glycoprotein catheters, Biases, and glucose-6-phosphatases, as well as inhibiting the liver's uptake and conversion of lac-tate to alanine and glucose to alanine. Metformin also increases peripheral glucose uptake, reduces fatty acid oxidation,anddecreasesglucoseabsorptionfrom the intestine.

At the cellular level,theeffectsof metformin on AMPK are mediated by phosphorylation, which modulates the activity of both catalytic a1s and a2s ofAMPK. This results in improved muscle glucose uptake when insulin is present. In mice skeletal muscle cell lines, the effect of metformin is mediated by threonine a2-residue a2-phosphorylation, which is maintained upon discontinuation of the medication.[95] The use of metformin has been shown to have a modest beneficial effect on the lipid profile of patients with PCOS.[96] Additionally, it does not appear to have

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

a teratogenic effect when used during pregnancy. Furthermore, it has been shown to reduce inflammation and complications associated with pregnancy.[97]

Furthermore,whenusedinconjunctionwithClomipheneCitrate,ithasbeenfound toincreasetheovulationrateandpregnancyrateofInfertilepatientswithPCOS [98].Furthermore, when combined with antiandrogens such as flutamide, it has been observed to have a synergetic effect in women with PCOS who are obese, although this effect is not observed to be safe for laboratory animals.[99] Furthermore, a beneficial effect was observed to improve hyperan- dragonish of PCOS women with the use of metformin and lifestyle modification [100]

V. CONCLUSION:

In conclusion, addressing polycystic ovarian syndrome (PCOS) in adolescents requires a multidisciplinary approach. Early recognition, coupled with lifestyle interventions, formsthecornerstoneof management. Regularmonitoringandindividualizedcarearecrucialfor mitigatinglong-termcomplications.Furtherresearchisneededtoenhanceourunderstandingof PCOSinadolescentsandrefinetreatmentstrategies,ensuringcomprehensiveandeffectivesupport for this population.Oralcontraceptiveslike norethisterone, desogestrel, are commonly prescribed for PCOS to regulate menstrual cycles, reduce androgen levels, and manage symptoms. While effective for many, individual responses vary, and potential side effects should be discussed with a healthcare provider for personalized guidance and monitoring.Antiandrogens, likespironolactone, can be effective in managing PCOS symptoms likeacne and hirsutism by blocking androgen effects. However, individual responses and potential side effects vary, necessitating careful consideration and monitoring under the guidance of a healthcare provider.Insulinsensitizers,likemetformin,areusedin PCOStoimproveinsulinresistance.Theycan help regulate menstrual cycles and manage metabolic aspects. While generally effective, individual responses vary,andconsultingwithahealthcareprovideris crucial toassesssuitability,potential side effects, and monitoring needs.

Compliance with ethical standards

Acknowledgments

A special thanks to Dr. Kalpesh Patel for her endless support and guidance providedduring the completion of this review article.

Funding

This research did not receive any grants from funding agencies in the public or privatesectors.

Disclosure of Conflict of Interest

No conflict of interest to be declared.

REFERENCES:

[1]. FauserBC,TarlatzisRW,RebarRS,etal:Consensusonwomen'shealthaspectsofpolycystic ovary syndrome (PCOS): the Amsterdam ESHRE/ASRM-Sponsored 3rd PCOS Consensus Workshop Group. Fertil Steril 2012; 97:28–38. e25.

[2]. Azziz R, Sanchez ES, Knochenhauer C, et al: Androgen excess in women: experience with Over 1,000 consecutive patients. J Clin Endocrinol Metab2004; 89:453–462.

[3]. Carmina E, Rosato F, Janni A, Rizzo M, Longo RA: Extensive clinical experience: relative prevalence of different androgen excess disorders in 950 women referred because of clinical hyperandrogenism. J Clin Endocrinol Metab2006; 91:2–6.

[4]. Witchel SF, Oberfield SE, Peña AS. Polycystic Ovary Syndrome: Pathophysiology, Presentation, and Treatment with Emphasis on Adolescent Girls. J Endocr Soc. 2019; 3(8):1545–1573.

[5]. Khalid, N.H.M.;Ahmed, I.A.M.;Ahmed, S.A.F. Evaluation of Causes of Female Infertility Using Ultrasonography in Najran, SaudiArabia.Afr. J. Reprod. Health 2022, 26, 90–95.

[6]. Kanwal, H.I.; Shahid, M.; Bacha, R. Sonographic Evaluation of Various Causes of Female Infertility:ALiterature Review. J. Diagnostic Med. Sonogr. 2022, 38, 155–159.

[7]. Vink, J.M.; Sadrzadeh, S.; Lambalk, C.B.; Boomsma, D.I. Heritability of Polycystic Ovary Syndrome in a Dutch Twin-Family Study's. Clin. Endocrinol. Metab. 2006, 91, 2100–2104.

[8]. Hiam, D.; Moreno-Asso,A.; Teide, H.J.; Laven, J.S.E.; Stepto, N.K.; Moran, L.J.; Gibson- Helm, M. The Genetics of

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

Polycystic ovary Syndrome: An Overview of Candidate Gene Systematic Reviews and Genome-WideAssociation Studies. J. Clin. Med.2019, 8, 1606.

[9]. Christman GM, Randolph JF, Kelch RP, Marchall JC: Reduction of gonadotropin-releasing hormonepulsefrequencyisassociatedwithsubsequentselectivefolliclestimulatinghormone secretion inwomenwithpolycysticovariandisease. JClinEndocrinolMetab72:1278,1991.

[10]. CourinetB,LeStratNL,BraillyS,SchaisonG: Comparativeeffectsofcyproteroneacetateora long-acting Gonadotropin-releasing hormone agonist in polycystic ovarian disease. J Clin Endocrinol Metab 63: 1031, 1986.

[11]. Kakoly,N.;Khomami,M.; Joham,A.E.; Cooray,S.D.;Misso,M.L.;Norman,R.J.;Harrison, C.L.;Ranasinha,S.;Teede,H.J.;Moran, L.J.Ethnicity,ObesityandthePrevalenceofImpaired GlucoseToleranceandType2DiabetesinPCOS:ASystematicReviewandMeta-Regression. Hum. Reprod. Update 2018, 24, 455–467.

[12]. Lentscher, J.; Slocum, B.; Torrealday, S. Polycystic Ovarian Syndrome and Fertility. Clin. Obstet. Gynecol. 2021, 64, 65–75. Petríková, J.; Lazarov, I.; Yehuda, S. Polycystic ovary syndrome and autoimmunity. Eur. J. Intern. Med. 2010, 21, 369–371.

[13]. Dunaif A, Givens JR, Haseltine FP, Merriam GR (eds): Polycystic Ovary Syndrome. Boston, Blackwell Scientific Publications 1992, vol 4, pp 377–384.

[14]. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group: Revised 2003 Consensus on diagnostic criteria and long-Term health risks related to polycystic ovary Syndrome. Fertil Steril 2004; 81:19–25.

[15]. Azziz R, Carmina E, Dewailly D, et al: TheAndrogen Excess and PCOS Society criteria Forthepolycysticovarysyndrome:thecompletetaskforcereport.FertilSteril2009;91:456–488.

[16]. Johnson T, Kaplan L, Ouyang P, Rizza R: National Institutes of Health Evidence-Based Methodology Workshop on Polycystic Ovary Syndrome (PCOS). NIH ebmw Report. Bethesda, National Institutes of Health, 2012, Vol 1, pp 1–14.

[17]. Barber TM, Wass JA, McCarthy I, Franks S: Metabolic characteristics of women with Polycystic ovaries and oligo-amenorrhea but Normal androgen levels: implications for the Management of polycystic ovary syndrome. Clin Endocrinol (Ox) 2007; 66:513–517.

[18]. Guastella E, Longo RA, Carmina E: Clinical And endocrine characteristics of the main Polycystic ovary syndrome phenotypes. Fertil Steril 2010; 94:2197–2201.

[19]. Rosenfield RL, Ghai K, Ehrmann DA, et al. Diagnosis of polycystic ovary syndrome in adolescence. Comparison of adolescent and adult hyperandrogenism. J Pediatr Endocrinol Metab. 2000; 13:1285.

[20]. Legro RS, Strauss JF. Molecular progress in infertility: polycystic ovary syndrome. Fertil Steril. 2002; 78:569.

[21]. Kahsar-Miller MD, Nixon C, Boots LR, et al. Prevalence of polycystic ovary syndrome (PCOS) in first-degree relatives of patients with PCOS. Fertil Steril. 2001; 75:53.

[22]. LegroRS,DriscollD,StraussJF,III,etal.Evidenceforageneticbasisforhyperandrogenemia in polycystic ovary syndrome. Proc NatlAcad Sci U SA. 1998; 95:14956.

[23]. Khan MJ, UllahAand Basit S. Genetic basis of polycystic ovary syndrome (PCOS): current perspectives. Appl Clin Genet 2019; 12: 249–260.

[24]. Muccee,F.;Bijou,O.Harakeh,S.;Adawiyah, R.;Sayyed,R.Z.;Haghshenas,L.;Alshehri,D.; Ansari, M.J.; Ghazanfar, S. In-Silico Investigation of Effects of Single-Nucleotide Polymorphisms in PCOS-Associated CYP11A1 Gene on Mutated Proteins. Genes 2022, 13, 1231.

[25]. Kazemi M., HadiA., Pierson R.A., Lujan M.E., Zello G.A., Chilibeck P.D. Effects of dietary glycemic index and glycemic load on cardiometabolic and reproductive profiles in Women with polycystic ovary syndrome: A systematic review and meta-analysis of randomized controlled trials. Adv. Nutrit. 2021; 12:161–178. Doi:10.1093/advances/nmaa092.

[26]. SzczukoM.,SkowronekM.,Zapalowska-ChwycM.,StarczewskiA.Quantitativeasses

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

sment of nutrition in patients with polycystic ovary syndrome (PCOS) RocznikiPaństwowego Zakładu Higieny. 2016; 67:4.

[27]. Kandaraki, E.; Chatzigeorgiou,A.; Livadas, S.; Palioura, E.; Economou, F.; Koutsilieris, M.; Palmieri, S.;Panidis, D.;Diamanti-Kandarakis, E. Endocrinedisruptors and polycysticovary syndrome (PCOS): Elevated serum levels of bisphenol A in women with PCOS. J. Clin. Endocrinol. Metab. 2011, 96, E480–E484.

[28]. Takeuchi,T.;Tsutsumi,O.;Ikezuki,Y.;Takai ,Y.;Taketani,Y.Positiverelationshipbetwee n androgenandtheendocrinedisruptor, BisphenolA,innormalwomenandwomenwi thovarian dysfunction. Endocr. J. 2004, 51, 165–169

[29]. Konieczna,A.;Racho´n,D.;Owczarek,K.;K ubica, P.;Kowalewska,A.;Kudłak,B.;Wasik, A.;Namie´snik,J.SerumbisphenolAconcent rationscorrelatewithserumtestosteronelevel s in women with polycystic ovary syndrome. Reprod. Toxicol. 2018,82, 32–37.

[30]. Vagi,S.J.;Azziz-Baumgartner, E.;Sjödin,A.;Calafat,A.M.;Dumesic,D.;Gon zalez, L.;Kato, K.; Silva, M.J.; Ye, X.; Azziz, R. Exploring the potential association between brominated diphenyl ethers, polychlorinated biphenyls, organochlorine pesticides,Perfluorinated compounds, phthalates, and bisphenol a in polycystic ovary syndrome:Acase–control study. BMC Endocr. Disord.2014, 14, 86.

[31]. Knochenhauer ES, Key TJ, Kahsar-Miller M et al. Prevalence of the polycystic ovary syndrome in Unselected black and white women of the southeastern United States: a prospective study. The Journal of Clinical Endocrinology and Metabolism 1998; 83: 3078– 3082.

[32]. Azziz R, Woods KS, Reyna R et al. The prevalence and features of the polycystic ovary syndromeinanUnselectedpopulation.TheJo urnalofClinicalEndocrinologyandMetaboli sm 2004; 89: 2745–2749.

[33]. Azziz R, Woods KS, Reyna R, Key TJ, Knochenhauer ES, Yildiz BO. The prevalence and features of the polycystic ovary syndrome in an unselected population. J Clin Endocrinol Metab. 2004; 89:2745–2749.

[34]. Diamanti-Kandarakis E, Kouli CR, Bergiele AT, et al. A survey of the polycystic ovary syndrome in the Greek island of Lesbos: hormonal and metabolic profile. J Clin Endocrinol Metab. 1999; 84:4006–4011.

[35]. KnochenhauerES,KeyTJ,Kahsar-MillerM,WaggonerW,BootsLR,AzzizR.Pr evalenceof the polycystic ovary syndrome in unselected Black and white women of the southeastern United States: a prospective Study. J Clin Endocrinol Metab. 1998; 83:3078–3082.

[36]. MichelmoreKF,BalenAH,DungerDB,Vesse yMP.Polycysticovariesandassociatedclinica land biochemical features in young women. Clin Endocrinol (Oxf). 1999; 51:779– 786.

[37]. Asuncion M, Calvo RM, San Millan JL, Sancho J, Avila S, Escobar-Morreale HF. A prospectivestudyoftheprevalenceofthepoly cysticOvarysyndromeinunselectedCaucasi an women from Spain. J Clin Endocrinol Metab. 2000; 85:2434–2438.

[38]. MehrabianF,KhaniB,KelishadiR,Ghanbari E.TheprevalenceofPolycysticovarysyndro me inIranianwomenbasedondifferentdiagnosti ccriteria.EndocrinalPol.2011;62(3):238–242.

[39]. March WA, MooreVM, Willson KJ, Phillips DI, Norman RJ, Davies MJ. The prevalence of polycystic ovary syndrome in a community sample Assessed under contrasting diagnostic criteria. Hum Reprod. 2010;25(2): 544–551.

[40]. TehraniFR,SimbarM,TohidiM,Hoseinpana hF,AziziF.ThePrevalenceofpolycysticovar y syndrome in a community sample of Iranian population: Iranian PCOS prevalence study. Reprod Biol Endocrinol. 2011; 9:39.92.

[41]. March WA, MooreVM, Willson KJ, Phillips DI, Norman RJ, Davies MJ. The prevalence of polycystic ovary syndrome in a community sample Assessed under contrasting diagnostic criteria. Hum Reprod. 2010;25(2): 544–551.

[42]. TehraniFR,SimbarM,TohidiM,Hoseinpana hF,AziziF.ThePrevalenceofpolycysticovar y syndrome in a community sample of

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

Iranian population: Iranian PCOS prevalence study. Reprod Biol Endocrinol. 2011; 9:39.

[43]. YildizBO,BozdagG,YapiciZ,EsinlerI,YaraliH.Prevalence,phenotypeandcardiometabolicrisk of polycystic ovary syndrome under different diagnostic criteria. Hum Reprod. 2012;27(10):3067–3073.

[44]. NelsonVL,LegroRS,StraussJF&mcallisterJM.Augmentedandrogenproductionisastable phenotypeofpropagatedthecaCellsfrompolycysticovaries.MolEndocrinol1999;13:946 – 957.

[45]. Diamanti-Kandarakis E. Polycystic ovarian syndrome: pathophysiology, molecular aspects and clinical implications. 30.Expert Rev Mol Med 2008; 10(2): e3.

[46]. Gilling-SmithC,StoryH,RogersV&FranksS.Evidenceforaprimaryabnormalityofthecal cell steroidogenesis in the Polycystic ovary syndrome. Clin Endocrinol 1997; 147(1): 93–99.

[47]. Pastor CL, Griffin-Korf ML,AloiJAet al. Polycystic ovary syndrome: evidence for reduced sensitivity of the gonadotropin Releasing hormone pulse generator to inhibition by estradiol and progesterone. J Clin Endocrinol Metab 1998; 83: 582–590.

[48]. Ibáñez,L.;Oberfield,S.E.;Witchel,S.;Auchus,R.J.;Chang,R.J.;Codner,E.;Dabadghao, P.; Darendeliler, F.; Elbarbary, N.S.; Gambineri,A.; et al.An International Consortium Update: Pathophysiology,Diagnosis,andTreatmentofPolycysticOvarianSyndromeinAdolescence. Horm. Res. Paediatr. 2017, 88, 371–395

[49]. ChangAY,AbdullahSM,JainT,StanekHG, DasSR,McGuireDK,AuchusRJ,deLemosJA: Associations among androgens, estrogens, and natriuretic peptides in young women: Observations from the Dallas Heart Study. JAm Coll Cardiol 2007; 49:109–116.

[50]. BarberTM,McCarthyMI,WassJA,FranksS. Obesityandpolycysticovarysyndrome.Clin Endocrinol (Oxf) 2006; 65: 137 – 45.

[51]. UsiK, MaezonoK,OsmanA, Insulin resistancedifferentiallyAffectsthePI 3-kinase- and MAPkinase-mediated signaling in Human muscle. J Clin Invest 2000; 105: 311 – 20.

[52]. Rice S, Christoforidis N, Gadd C, Impaired insulin-dependent Glucose metabolism in granulosa-luteincellsfromanovulatoryWomenwithpolycysticovaries.HumReprod2005;20: 373 – 81.

[53]. VassiliadisDA, Barber TM, Hughes BA et al. Increased 5 alpha reductase activity and adrenocorticaldrive-inwomenwithpolycysticovarysyndromeJClinEndocrinolMetab2009;94:3558– 66.

[54]. Khan, M.J.; Ullah,A.; Basit, S.;Munawwara,A.;Arabia, S. Genetic Basis of Polycystic Ovary Syndrome (PCOS): Current Perspectives.Appl. Clin. Genet. 2019, 12, 249–260.

[55]. Vink, J.M.; Sadrzadeh, S.; Lambalk, C.B.; Boomsma, D.I. Heritability of Polycystic Ovary Syndrome in a Dutch Twin-Family Study. J. Clin. Endocrinol. Metab. 2006, 91, 2100–2104

[56]. Hiam, D.; Moreno-Asso,A.; Teede, H.J.; Laven, J.S.E.; Stepto, N.K.; Moran, L.J.; Gibson- Helm, M. The Genetics of Polycystic Ovary Syndrome: An Overview of Candidate Gene Systematic Reviews and Genome-WideAssociation Studies. J. Clin. Med. 2019, 8, 1606.

[57]. Stener-Victorin, E.; Deng, Q. Epigenetic Inheritance of Polycystic Ovary Syndrome— Challenges and Opportunities for Treatment. Nat. Rev. Endocrinol. 2021, 17, 521–533

[58]. Cannarella,R.;Condorelli,R.A.;Mongioì,L.M.;LaVignera,S.;Calogero,A.E.DoesaMale Polycystic Ovarian Syndrome Equivalent Exist? J. Endocrinol. Investing. 2018, 41, 49–57

[59]. Zawadski, J.; Dunaif, A. Diagnostic Criteria for Polycystic Ovary Syndrome. In Polycystic OvarySyndrome;Dunaif,A.,Givens,J., Haseltine,F.,Eds.;BlackwellScientific:Boston,MA, USA, 1992; pp. 377–384.

[60]. Chang, S.; Dunaif,A. Diagnosis of Polycystic Ovary Syndrome: Which Criteria to Use and When? Endocrinol. Metab. Clin. N.Am. 2021, 50, 11–23.

[61]. Polson, D.; Adams, J.; Wadsworth, J.; Franks, S. Polycystic ovaries–a common finding in normal women. Lancet 1988, 1, 870–872.

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

[62]. Fauser, B.; Tarlatzis, B.; Rebar, R.; Legro, R.; Balen,A.; Lobo, R.; Carmina, E.; Chang, J.; Yildiz, B.O.; Laven, J.; et al. Consensus on Women's health aspects of polycystic ovary syndrome (PCOS): TheAmsterdam ESHRE/asrmsponsored 3rd PCOS Consensus Workshop Group. Fertil. Steril. 2012, 97, 28–38. e25.

[63]. Ibanez,L.;Oberfield,S.E.;Witchel,S.;Auch us,R.J.;Chang,R.J.;Codner,E.;Dabadghao, P.; Darendeliler, F.; Elbarbary, N.S.; Gambineri,A.; et al.An International Consortium Update: Pathophysiology,Diagnosis,andTreatment ofPolycysticOvarianSyndromeinAdolesce nce. Horm. Res. Paediatr. 2017, 88, 371–395.

[64]. Peña,A.S.; Witchel, S.F.; Hoeger, K.M.; Oberfield, S.E.; Vogiatzi, M.G.; Misso, M.; Garad, R.; Dabadghao, P.; Teede, H. Adolescent Polycystic ovary syndrome according to the international evidence-based guideline. BMC Med. 2020, 18, 72.

[65]. Codner E, Villarroel C, Eyzaguirre FC, López P, Merino PM, Pérez-Bravo F, Iñiguez G, Cassorla F: Polycystic ovarian morphol- Ogy in postmenarchal adolescents. Fertil Steril2011; 95:702–6. e1–e2.

[66]. MurphyMK,HallJE,AdamsJM,LeeH,Welt CK:PolycysticovarianmorphologyinNorm al women does not predict the devel-Opment of polycystic ovary syndrome. J Clin Endocrinol Metab 2006; 91:3878–3884.

[67]. Dewailey D: Diagnostic criteria for PCOS: isThere a need for a rethink? Best Pract Res Clin ObstetGynaecol 2016:37:5–11.

[68]. Holm K, Laursen EM, Brocks V, Muller J: Pubertal maturation of the internal genitaLia: an ultrasoundevaluationof166.Ultra-SoundObstetGynecol1995; 6:175–181.119.KelseyTW, Dodwell SK, WilkinsonAG, Greve T,AndersenCY,Anderson RA, WalLace WH: Ovarian volume throughout life: a Validated normative model. Plos One 2013; 8: e71465.

[69]. BentzenJG,FormanJL,JohannsenTH,pin BorgA, LarsenEC,AndersenAN:OvarianAntral follicle subclasses and anti-mullerian Hormone during normal reproductive aging. J Clin Endocrinol Metab 2013; 98:1602–1611.

[70]. MortensenM,RosenfieldRL,LittlejohnE:Fu nctionalsignificanceofpolycystic-sizeOvaries in healthy adolescents. J Clin Endo- Crisol Metab 2006; 91:3786–3790. 122.

[71]. Villarroel C, Merino PM, López P, Eyzaguirre FC, Van VelzenA, Iñiguez G, cornered: Polycystic ovarian morphology in adolecents with regular menstrual cycles is associated with elevated anti-Mullerian hormone. Hum Reprod 2011; 26:2861–2868.

[72]. Dewailly D, Lujan ME, Carmina E, Cedars MI, Laven J, Norman RJ, Escobar-Morreale HF: Definition and significance of polycystic Ovarian morphology: a task force report from the AndrogenExcessandPolycysticOvarySyndr omeSociety.Hum ReprodUpdate2014; 20:334– 352.

[73]. Azziz R, Carmina E, Dewailly D, diamantikandarakis E, Escobar-Morreale HF, Fut-TerweitW,JanssenOE,LegroRS,NormanRJ ,TaylorAE,WitchelSF;TaskForceonthePhe notypeofthePolycysticOvarySyndromeofT heAndrogenExcessandPCOSSociety:The Androgen Excess andPCOSSocietycriteriaforthepolycystico varysyndrome:thecompletetaskforce report. Fertil Steril 2009; 91:456–488.

[74]. Rosenfield RL: The polycystic ovary morphology-polycystic ovary syndrome spectrum PediatrAdolescGynecol 2014;28: 412–419.

[75]. Van Hooff MH, Voorhorst FJ, Kaptein MB, Hirasing RA, Koppenaal C, Schoemaker J: Polycysticovariesinadolescentsandtherelati onshipwithmenstrualcyclepatterns,luteiniz ing hormone, androgens, and insulin. Fertil Steril 2000; 74:49–58.

[76]. Venturoli S, Porcu E, Fabbri R, Magrini O, Gammi L, Paradisi R, Flamigni R: Longitudinal evaluationofthedifferentgonadotropinpulsa tilepatternsinanovulatorycyclesofyounggir ls. J Clin Endocrinol Metab127.1992;74:836–841.

[77]. Mortensen M, Ehrmann DA, Littlejohn E, Rosenfield RL:Asymptomatic volunteers

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1392-1405www.ijprajournal.com ISSN: 2456-4494

with a polycystic ovary are a functionally distinct but heterogeneous population. J ClinendocrinolMetab 2009; 94:1579–1586.

[78]. Teede HJ, Misso ML, Deeks AA, Moran LJ, Stuckey BG, Wong JL, et al. Assessment and management of polycystic ovary syndrome: summary of an evidence-based guideline. Med J Aust 2011;195(6):S65–S112

[79]. BekxT,ConnorEC,AllenDB.Characteristic sofadolescentspresentingtoaMultidisciplinary clinic for polycystic ovarian syndrome. J PediatrAdolescgynecol 2010; 23:7–10.

[80]. Carmina E, Oberfield SE, Lobo RA. The diagnosis of polycystic ovary syndrome In adolescents. Am J ObstetGynecol 2010; 203:201. e1-5.

[81]. The Amsterdam ESHRE/ASRM-Sponsored 3rd PCOS Consensus Workshop Group. Consensus on women's health aspects of polycystic ovary syndrome (PCOS). Hum Reprod2012;27(1):14–24.

[82]. TeedeHJ,MissoML,CostelloMF,etal.Recommendations Fromtheinternationalevidence- based guideline for the Assessment and management of polycystic ovary syndrome. Hum Reprod 2018; 33(9): 1602–1618

[83]. Geller, D.H., Pacaud, D., Gordon, C.M., Misra, M., 2011. Emerging therapies: the use of insulin sensitizers in the treatment of adolescents with polycystic ovary syndrome (PCOS). Int. J. Pediatr. Endocrinol. 9. Doi:10.1186/1687-9856-2011-9.

[84]. Grimes,D.A.,Economy,KE.,1995Jan1.Primarypreventionofgynecologiccancers.Am. J. Obstet. Gynecol. 172 (1), 227–235. Doi:10.1016/0002-9378(95)90125-6.

[85]. Halperin, I.J., Sujana Kumar, S., Stroup, D.F., Laredo, S.E., 2011 Jan 1. The association between the combined oral contraceptive pill and insulin resistance, deglycation and dyslipidemia in women with polycystic ovary syndrome: a systematic Review and meta- analysis of observational studies. Hum. Reprod. 26 (1), 191–201. Doi:10.1093/humrep/deq301.

[86]. Ganie MA, Khurana ML, Eunice M, Gupta N, Gulati M, Dwivedi SN, Ammini AC. Comparison of efficacy of spironolactone with metformin in the Management of polycystic ovary syndrome: an open-labeled study. J Clin Endocrinol Metab. 2004;89(6):2756–62.

[87]. TartagniM,SchonauerMM,CicinelliE,PetruzzelliF,DePergolaG,DeSalviaMA,LoverroG.Intermittentlow-dosefinasterideisaseffectiveasdailyadministrationforthetreatmentof hirsute women. Fertil Steril. 2004;82(3):752–5.

[88]. GambineriA, Patton L, VaccinaA, Cacciari M, Morselli-LabateAM, Cavazza C, Pagotto U, Pasquali R. Treatment with flutamide, metformin, and their Combination added to a hypocaloricdietinoverweight-obese women withPolycysticovarysyndrome: arandomized, 12-month, placebo-controlled Study. J Clin Endocrinol Metab. 2006;91(10):3970–80.

[89]. AmiriM,GolsorkhtabaramiriM,EsmaeilzadehS,GhofraniF,BijaniA,GhorbaniL,Delavar MA. Effect of metformin and flutamide onanthropometric indices and laboratory tests in obese/overweight PCOS Women under hypocaloric diet. J ReprodInfertil. 2014;15(4):205– 13.

[90]. AntiandrogentreatmentofpolycysticovaryS yndrome.Endocrinol.Metab.Clin.NorthAm. 28 (2), 409–421.Doi:10.1016/S0889-8529(05)70077-3.

[91]. Pasquali,R.,Gambineri,A.,2014Feb1.Therapyofendocrinedisease:TreatmentOfhirsutisminthepolycysticovarysyndrome.Eur.J.Endocrinol.170(2).Doi:10.1530/EJE-13-0585,R75- 90.

[92]. Fryer LG, Parbu-Patel A, Carling D: The Anti-diabetic drugs rosiglitazone and metformin stimulate AMP-activated protein kinase through distinct Signaling pathways. J Biol Chem 2002, 277(28):25226-32.

[93]. Wulffelé, E.M., Kooy,A., De Zeeuw, D., Stehouwer, C.D., Gansevoort, RT., 2004 Jul. The effect ofmetforminonbloodpressure,plasmacholesteroland triglyceridesIntype2diabetes mellitus: a systematic review. J. Intern. Med. 256 (1), 1–4. Doi:10.1111/j.1365-2796.2004.01328.x.

[94]. Isoda, K., Young, J.L., Zirlik,A., MacFarlane, L.A., Tsuboi, N., Gerdes, N., Schonbeck, U., Libby, P.Metformin

inhibits proinflammatory responses and nuclear Factor-κB in human vascular wall cells. Arterioscler. Thromb. Vasc. Biol. 26 (3), 611– 617. Doi: 10.1161/01.ATV.0000201938.78044.75.

[95]. Glueck, C.J., Wang, P., Goldenberg, N., 2002 Nov 1. Sieve-Smith L. Pregnancy outcomes Among women with polycystic ovary syndrome treated with metformin. Hum. Reprod. 17 (11), 2858–2864. Doi:10.1093/humrep/17.11.2858.

[96]. Dasari, P., Pranahita, GK., 2009 Jan. The efficacy of metformin and clomiphene citrate Combination compared with clomiphene citrate alone for ovulation induction in infer- Tile patients with PCOS. J . Hum. Reprod. Sci. 2 (1), 18 10.4103%2F0974-1208.51337.

[97]. Gambineri, A., Pelusi, C., Genghini, S., Morselli-Labate, A.M., Cacciari, M., Pagotto, U., Pasquali, R., 2004 Feb. Effect of flutamide and metformin administered alone or Incombinationindietingobesewomenwithpolycysticovarysyndrome.Clin.Endocrinol.(Oxf) 60 (2), 241–249. Doi:10.1111/j.1365-2265.2004.01973.

[98]. Venky, E., Salvesen, K.Å., Carlsen, SM., 2004 Mar 1. Six-month treatment with low- dose Dexamethasone further reduces androgen levels in PCOS women treated with diet and Lifestyle advice, and metformin. Hum. Reprod. 19 (3), 529–533. Doi:10.1093/hum- Rep/deh103.

[99]. Sivalingam,V.N., Myers, J., Nicholas, S., Balen,A.H., Crosbie, EJ., 2014 Nov1. Metformin in reproductive health, pregnancy and gynaecological cancer: established and emerging indications. Hum. Reprod. Update 20 (6), 853–868. Doi:10.1093/humupd/dmu037.

[100]. DunaifA, Green G, Futterweit W, et al: Suppression of hyperandrogenism Does not improve peripheral or hepatic insulin resistance in the Polycystic ovary syndrome. J Clin Endocrinol Metab 1990, 70(3):699-704.