

A Review on Pharmacological Non Pharmacological and Herbal Treatment of (PCOS) Polycystic Ovarian Syndrome

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Abstract: Polycystic ovarian syndrome is a multi factorial disease . PCOS is an endocrine disorder nowadays which results in fertility, one out of ten woman of childbearing age suffering from this, but it remains undiagnosed and unmanaged in most people who have it. PCOS as incidence of key criteria namely, Oligo ovulation/or anovulation Hyperandrogenism Woman have unique health issues. And some of the health issues that affect both men and woman can affect woman differently. Unique issues include pregnancy, menopause, and conditions of the female organs. woman can have a health pregnancy by getting early and regular prenatal care. They should also get recommended breast cancer, cervical, and bone density screening. Polycystic ovarian syndrome are treatment in pharmacological, non pharmacological as well as herbal treatment .Pharmacological treatment are using various type of drug like oral contraceptive pill, antiandrogen, metformin, inositol, spironolactone, flutamide, cyprolarone acetate .The teams Non pharmacologically means what is diet plane and herbal treatment are used to some herbs in Polycystic ovarian syndrome. Polycystic ovarian syndrome is used some herbs like Bauhinia Variegata, Cinnamon Cassie, Nigella Sativa.

Keywords: Polycystic ovarian syndrome, Pharmacological, Non pharmacological, Herbal Treatment

I. INTRODUCTION

Polycystic ovarian signify the ovaries with enlarged multiple number of cysts that are not bigger than 8mm. Polycystic ovary starts maturing at least twofold as many follicles compared normal most of them enlarge and mature hence do not release an egg. About 6-7% of the population throughout the world is suffering from PCOS.PCOS adverse affects endocrine, metabolic and cardiovascular health. The severity of the disease condition depends upon the state of disease. Early detection and management help to minimize the risk other health factors associated with PCOS.It is also known as Stein – Leventhal syndrome There’s no test to definitely diagnose PCOS. Your doctors are likely to start with a discussion of your medical history, including your menstrual periods and weight changes. A Physical exam will include checking for signs of excess hair growth, insulin resistance and acne. ^[1] Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in women and major cause of anovulatory infertility. PCOS patients can present a wide range of signs and symptoms, which make difficult the precise grading of the condition. Diagnosis of PCOS is currently based on the criteria of the ESRHE/ASRM Rotterdam consensus meeting in 2003, which broadened the previous NIH classification of 1990

Table 1: Diagnostic criteria for PCOS (summary)

Year	Diagnostic criteria proposed by	Criteria	Number of criteria required for diagnosis	Phenotype
1990	National Institutes of Health	1.Hyperandrogenism 2.oligo – anovulation	Two out of two	
2003	Rotterdam’s criteria	1.Hyperandrogenism 2.Ovulatory dysfunction 3.Polycystic ovarian morphology (12 follicles 2-9	Two out of three	



		mm in each ovary with volume of 10 ml)		
2006	AE-PCOS	1.Hyperandrogenism 2.Ovulatory dysfunction	Two out of two	
2012	NIH 2012 extension of SHRE/ 2003 ASRM	1.HA 2.OD 3.PCOM	1. Two of three 2.Identification of specific phenotype	A.HA+OD+PCOM B.HA+OD C.HA+PCOM D.OD+PCOM

Diagnostic Criteria for PCOS in Adolescents

Diagnosis of PCOS is crucial at adolescence because hormonal and reproductive transition of normal puberty may mimic features of the syndrome

II. SYMPTOMS

Generally, the symptoms of this syndrome change from woman to woman depending upon the severity various sign and syndrome are enlisted below

- Menstrual problem : Oligo menorrhairregular menstruatio)
 - : Amenorrhea (absence of menstruation)
 - : Heavy menstruation
 - : Short and light menstruation or spotting
- Hair , skin and body: Excess facial and /or body hair (hirsutism)
 - : Acne on the face and /or body that can be severed
 - : Darkened skin patches (acanthosis nigricans)
- Obesity : Overweight or weight gain
- Mental & emotional : Mood changes
 - : Depression, Anxiety
 - : Low self esteem
 - : Poor body image
 - : Impact on quality of life
- Fertility issues. : Difficulty becoming pregnant
- Other condition. : Sleep apnoea
 - : Increased risk of diabetes, with earlier onset
 - : Sexual health challenge
 - : Increased risk cardiovascular disease [1, 2]

Sign of Polycystic Ovary Syndrome



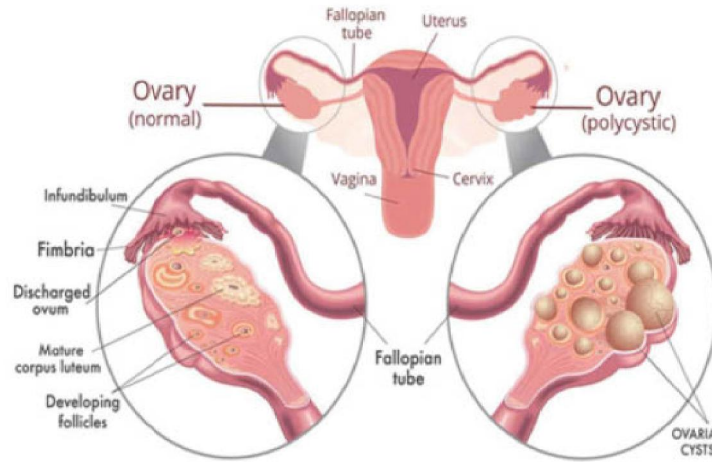
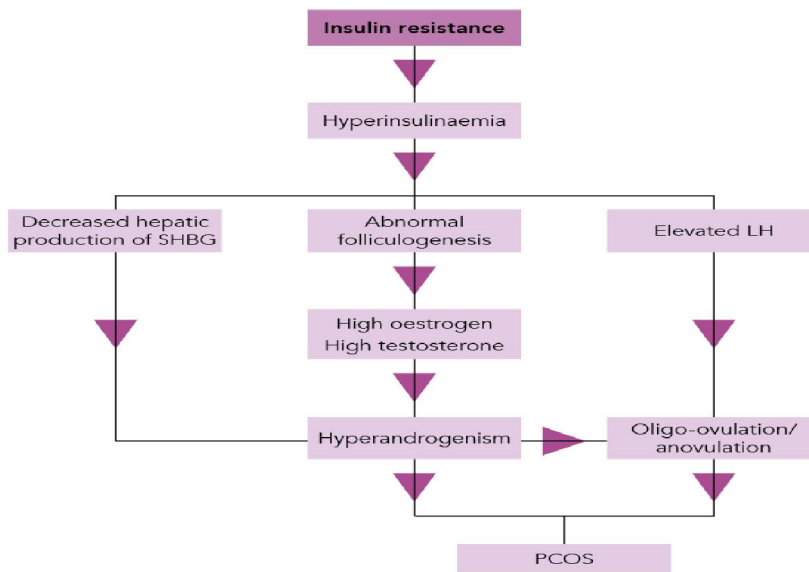


Figure 2: Excessive follicles, which is define as 25 or more follicles that are 2mm to 10 mm in a single view of a transvaginal ultrasound, may be presented in PCOS. Additionally increased ovarian volume, an ovary that is more than 10 ml may be presented

Phathophysiology of PCOS



Hyperandrogenism and GABA

Based on clinical findings showing elevated concentrations of GABA in the cerebrospinal fluid of women with PCOS, animal studies have also addressed the involvement of GABA. A hyperandrogenic environment in female mice in prenatal life can cause an increase in the frequency and degree of GABAergic postsynaptic firing onto GnRH neurons. Unlike its function in other brain circuits, GABA seems to exert an excitatory effect on GnRH neurons attributable to their high chloride content. This leads to greater secretion of LH by the pituitary gland, as occurs in PCOS. GnRH antagonists prevent this effect^[3].

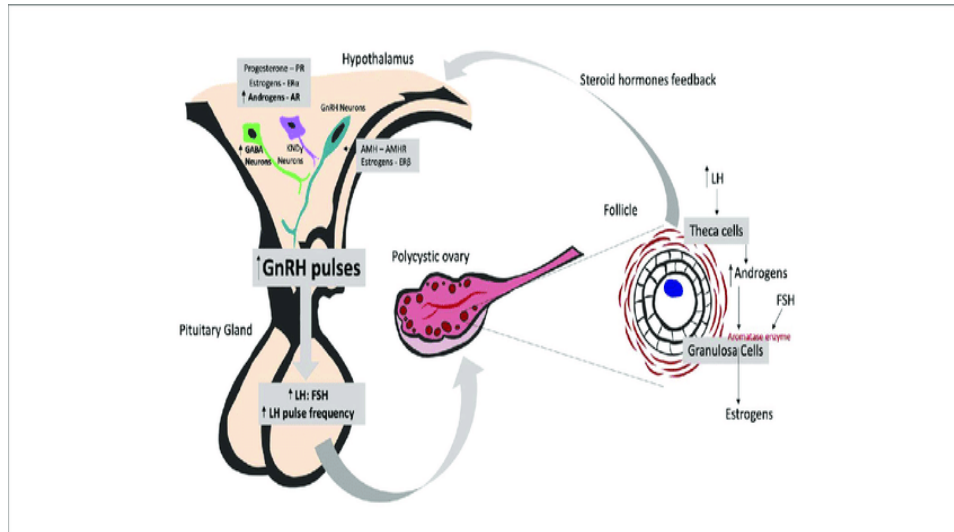


Figure 3: Understanding the neuroendocrine effects of the hyperandrogenic environment on PCOS development. AMH, Anti-Müllerian Hormone; AMHR, Anti Müllerian Hormone Receptor; AR, Androgen Receptor; ERa, Estrogen Receptor a; ERb, Estrogen Receptor b; FSH, Follicle-stimulating Hormone; GnRH, Gonadotropin-releasing Hormone; GABA neurons, gamma-Aminobutyric acid neurons; KNDy neurons, kisspeptin/dynorphin/neurokinin B neurons; LH, Luteinizing^[4]

III. TREATMENT

Symptom/Complication associated with PCOS	Herb used for Treatments
Hormonal imbalance	Bauhinia variegata
Regulation of hormones	Phyllanthus emblica, Terminalia bellirica, Terminalia chebula, and Commiphora wightii
Anti-oxidant	Cinnamon cassia, Ocimum sanctum
Reproductive dysfunction	Tribulus terrestris
Depression & Mood swings	Hypericum perforatum
Cholesterol	Nigella sativa
Estrogenic action	Saraca asoca
Folliculogenesis	Asparagus racemosus
Regulation of menstrual flow	Tinospora cordifolia

3.1 PCOS Treatment by Herbal

Herbal medicines were found to normalize female hormones, diminish male hormones recover the estrous cycle, ameliorate insulin resistance and improve lipid metabolism in PCOS model. Poly Cystic Ovarian Syndrome is a complex yet common disorder generally occurring in reproductive age group women. This disorder leads to sub-fertility in almost 70% of women facing difficulties in ovulation. Poly Cystic Ovarian Syndrome prevents the normal functioning of the ovaries because of the presence of cysts on the ovaries. Various underlying symptoms of this disorder include obesity or increased weight, high blood pressure, diabetes, dysfunction of the lipid profile, dandruff on the scalp or oily skin, the skin of neck and underarms covered with dark-colored patches, pelvic pain generally chronic, the problem of acne, males hormones levels are increased showing thinning of hair, baldness as per the male pattern, excessive growth of hair on body and face, in case of women, menstruation which is infrequent, irregular bleeding, no or infrequent ovulation, an, immature^[5]



3.2 Bauhinia Variegata

Bauhinia Variegata or **Kanchanar**, a tree with several medicinal uses practiced over a long time in the Ayurveda, is found in Indian Tropical and Temperate regions of the subcontinent. Kanchanar used for the treatment of PCOS is used in the form of Kanchanar Guggul. It serves as an effective treatment of various conditions like PCOS, Uterine cysts, several joint pains, and also in case of imbalance in the hormones. ‘Guggulu’ is the Sanskrit term for Guggul, which means to ‘protect from the diseases’. The role of Guggul is also to eliminate toxins from and body, as well as lymphatic system functioning, is improved. Kanchanar guggul has the following blend of herbs Varuna, black pepper, long pepper, kwath of Triphala, pure Guggul resin, cardamom, and cinnamon. The flowers of Bauhinia variegata as shown in **Fig.4**⁶



Figure 4 | Bauhinia variegata flower (Kanchanar). (A higher resolution / colour versions Of the figure is available in the electronic copy of the article).

3.3 Cinnamon Cassie

The bark of Dalchini has been used all over the world not just as a spice for cooking but also as a multi-functional medicine, both traditional as well as modern. The Dalchini has at least 25 species identified to date belonging to the cinnamon genus, and trees are found scattered around the world. Women with PCOS have been found to have insulin resistance and showed symptoms of hyperinsulinemia. When compared with controls, women were found to have insulin resistance to a greater extent. Women with menstrual irregularities and anovulation are generally caused due to hyperandrogenism and resistance to insulin. To a certain extent, synthetic drugs like metformin have treated the condition. However, they possess gastrointestinal side effects. Therefore, the natural herb, Dalchini, has shown a sensitizing effect in pre-clinical and clinical studies. The polyphenols present in the herb show an effect on increasing insulin-dependent glucose metabolism and, thus, the glucose transport is altered. The study suggests that women with PCOS can be treated with Dalchini as it improves irregularity in the menstrual cycle and provides effective treatment without side effects. The study also suggests that extract of the herb can be used to improve ovulation and menstrual cycle irregularities when compared with a placebo group. The study stated that cinnamon extract works as an antioxidant and improves the lipid profile. Thus, the side effects, and risk associated factors are reduced for women suffering from PCOS^[7,8,9]. **Fig. (5)** below shows Cinnamon cassia (Dalchini)



Figure 5: Cinnamon cassia (Dalchini). (A higher resolution /colour version his figure is available in the electronic copy of the article).

3.4 Nigella Sativa

Nigella sativa or Kalanji or black cumin belonging to the family Ranunculaceae is a plant of medicinal importance present throughout the country. The herb is used in all forms of a traditional medicinal system including, Ayurveda,



Unani, Siddha, etc. The plant of Kalaunji has a major role in the oil and seed part and is used in almost all forms of medicine. Kalaunji is used in the treatment of various medical conditions and diseases. It is known to be a healing medicine as per Islamic Literature .As per various studies, it is believed that black cumin is actively used in the treatment and management of Polycystic Ovarian Syndrome in women. It is believed that women suffering from PCOS have a greater chance of developing cholesterol. Therefore, as per the studies, Kalaunji was seen to have affected almost all the parameters. But, the major effect was seen on High-Density Lipoprotein and cholesterol .Black cumin regulated cholesterol and HDL levels while it up-regulates the LDL levels in the body. Due to choleric activity, as seen in the case of Kalaunji, it has a positive effect on the lipid profile. It is also believed that loss of appetite in the case of Kalaunji leads to a hypolipidemic profile^[9,10]



Figure 6: Nigella sativa (Kalaunji/ black cumin).(A higher resolution / colour version of this figure is available in the electroniccopy of the article).

3.5 Triphala

Triphala is the term used for a combination or a mixture of three fruits that is, Alma, Haritaki, and Baheda. Triphala is used to treat the condition of PCOS; it is considered an antioxidant and also a natural source of vitamin C, also acts as an anti-inflammatory agent. Triphala also acts as a detoxifying and cleansing agent helping in the treatment of PCOS.Superoxide and diphenylpicrylhydrazyl are the radicals that get scavenged by Triphala. Thus, it provides anti-inflammatoryaction.^[11] The scavenging of free radicals is generally aproperty of the phenolic compounds present in Triphala extracts. The role of these compounds mainly; is to improvethe problem of menstrual irregularities by influencing the control of hormones ‘Tridoshic Rasayana’, as per Ayurveda, is an agent withthe therapeutic value which works on three elements, namely, Vatta, Pitta, and Kapha; it provides balancing and rejuvenating effects on these constitutional elements. It is believed that as per Ayurveda, Triphala is a combination of Vatta, pitta, and Kapha, thus making it well balanced and detoxifying.^[12] Triphala has been described in the ancient Ayurvedic text as a Tridoshic Rasayana, a therapeutic agent with balancing and rejuvenating effects on the three humours or constitutionalelements in Ayurveda; Vatta, Pitta, and Kapha. Harad and Baheda have warm energy, while Amla is cool in nature.Triphala, being a combination of all three, is therefore balanced, making it useful as an internal cleansing, detoxifying formula. It is regarded as an important Rasayana and an internal cleansing, detoxifyingformula. The fruits of Triphala shown shown in this Figure 7.



Figure 7: Fruits of Triphala: Emblicaofficinalis (Amla), Terminaliabelletica (Baheda), Terminaliachebula (Harad). (A higher resolution / colour version of this figure is available in the electroniccopy of the article).



3.6 Ocimum Sanctum

Tulsi is a sacred herbal plant that has several medicinal uses; the major use of Tulsi is in the treatment of Hypoglycaemia and obesity. It is used for the treatment of the Poly Cystic Ovarian Syndrome because of its anti-androgenic properties. It declines the production of androgen, and manages obesity. As the proper ovulation process does not take place, the androgens are not utilized by the body. The reason for hirsutism and the problem of acne is the unutilized androgens. The role of Tulsi is the proper management and utilization of androgen levels. It also provides anti-oxidant action. Fig. (8) shows the picture of the plant *Ocimum sanctum*.^[13,14]



Figure 8: *Ocimum sanctum* Linn (Tulsi) (A higher resolution /colour version of this figure is available in the electronic copy of the article)^[26]

3.7 Non Pharmacological Treatment of PCOS.

A. Lifestyle Change Modification

Guidelines recommend exercise therapy and calorie-restricted diet as a crucial part of the management of obesity in women with PCOS. In fact, lifestyle modifications are considered as a cost-effective first line treatment and as a necessary adjunct to medication. Excessive weight, as previously mentioned, is associated with adverse metabolic and reproductive health outcomes in women with PCOS. For instance, female fertility significantly decreases with a BMI >30–32 kg/m². Multiple small uncontrolled trials have shown that a body weight decrease of as little as 5% regulates the menstrual cycle, improves fertility, reduces insulin and testosterone levels, decreases the degree of acne and hirsutism, and benefits psychological wellbeing^[15]. It is the first step of management which includes dietary restriction, exercise, and weight loss. It has been seen that just 5% loss of total body weight reduces the insulin resistance and testosterone levels with marked improvement in body composition and cardiovascular risk markers. Weight loss and increased physical exercise are generally recommended as the first-line therapy in overweight or obese girls. Two small randomized controlled trials (RCTs) and one well-controlled clinical study in overweight PCOS girls have shown that the combination of weight loss and intensified exercise decreases testosterone levels and the free androgen index, increases SHBG concentrations, and normalizes menstrual regularity comparably to drug therapy, and is devoid of side effects^[16]. The combination of lifestyle intervention with medications normalized more androgen levels and menses in one of these studies. However, long-term data reporting sustained benefits on cycle regularity or on pregnancy outcomes after weight loss in adolescent^[17]

B. Weight Loss

Elevated androgenic hormone levels lead to weight gain in women with PCOS, mainly in the abdominal area. As a result, many PCOS women have an apple shape body instead of a pear shape. The first step for women diagnosed with PCOS would be weight reduction and calorie intake restriction. Many studies demonstrate that even a 5% to 10% reduction in weight can restore the regular menstruation cycle. For obese women, it would be best if they could reach their normal range of body mass index (BMI).^[18] Obesity commonly is associated with PCOS. Fatty tissues produce excess estrogen, which in turn contributes to insufficient FSH secretion by the pituitary gland. Insufficient FSH prevents ovulation and may worsen PCOS. In addition, obesity is associated with the development or worsening of insulin resistance, which may further increase androgen production by the ovaries^[19]

**C. Diet**

Although nutrition contributions to PCOS is unclear, studies showed a relationship between some nutrient levels and PCOS indices. Saturated fatty acids (SFAs) intake plays a role in PCOS by producing an inflammatory status and reducing insulin sensitivity. Taking SFAs induces inflammation by triggering an increase in TNF- α level in circulation and expressing a specific cytokine suppressor^[20] Additionally, diet has been found to be a contributing factor for PCOS. Fats and proteins from one's diet can form advanced glycation end products (AGEs) when exposed to sugar in the bloodstream.^[21] These compounds are known to contribute to increased bodily stress and inflammation, which have been linked to diabetes and cardiovascular disease. 40 PCOS patients already have an increased likelihood for metabolic syndrome, cardiovascular issues, and diabetes. Thus, it's best to limit exposure to AGEs. Animal-derived foods that are high in fat and protein are generally AGE-rich and prone to more AGE formation during cooking. In contrast, foods that are low on the glycaemic index—such as vegetables, fruits, whole grains^[22,23,24]

D. Exercise

Exercise and physical activity play a key role in weight reduction. They may be beneficial to improve insulin sensitivity. Different studies suggest various times for exercise during the week, but the American Heart Association (AHA) recommend approximately 150 min of moderate or 75 min of vigorous and intense exercise per week. Several studies show that exercise, with or without being on a diet, can resume ovulation in women with PCOS. Exercise probably can affect ovulation through modulation of the hypothalamic-pituitary-gonadal (HPG) axis. In overweight and obese women, exercise leads to lower insulin and free androgen levels, inducing the restoration of HPA regulation of ovulation^[25,26,27]

E. Local Therapies/ Cosmetic

Cosmetic hair-removal methods for hirsutism include bleaching, chemical epilation, plucking, waxing, shaving, electrolysis, and laser hair removal. Although only the latter result in permanent – albeit partial – hair removal, efficacy and safety of electrolysis is not supported by any RCT. We suggest photoepilation as first-line management of localized hirsutism in PCOS; diode and alexandrite lasers are preferred. Topical eflornithine is recommended as an adjuvant to photoepilation in cases with laser-resistant facial hirsutism or as monotherapy in patients with facial hirsutism where photoepilation is not indicated. The use of topical finasteride is not recommended based on the existing data. The therapeutic goal is to achieve inhibition of ovarian androgen production and decrease their bioavailable forms by increasing SHBG levels^[28]

3.8 Pharmacological Treatment of PCOD

Before heading to pharmacological approaches, healthy lifestyle advice must be given to all women diagnosed with PCOS regardless of their weight, complaint, or anything else. This is because, in most cases, and especially in mild to moderate forms, women can solely benefit from diet and exercise. However, the treatment would really mainly on the patient's choices and condition in others. If the patient does not want to get pregnant and complains mostly about her menstruation irregularity, combined oral contraceptive COCs) or progestins are the drugs of choice.

A. Oral Contraceptive Pills

OCP are the most commonly used medications for the long-term treatment of women with PCOS and have been recommended by the Task Force and the Endocrine Society's, the Australian Alliances, and the PCOS Consensus Group as first-line treatment for hyperandrogenism and menstrual cycle irregularities in women with PCOS. Combined oral contraceptive pills (COCPs) are commonly prescribed for adults and adolescents with PCOS to ameliorate the clinical symptoms. Different combinations of COCPs are available with heterogeneous estrogen and progestin preparations with varying pharmacological and clinical properties. There are no high-quality RCTs of specific OCP formulations for adolescents with PCOS to help decision-making in this population, and no specific formulation can be recommended over another (Level B)

**B. Metformin**

Metformin (Glucophage), an oral anti-diabetic biguanide drug, acts by impeding hepatic glucose production and increasing the peripheral insulin sensitivity. The earliest studies on PCOS patients using metformin were performed in 1994 by ;the results revealed a 35% reduction in the insulin area and a 31% decrease in insulin area to glucose ratio. Some data revealed that metformin does not improve insulin resistance itself, rather it improves glucose effectiveness, i.e., the ability of glucose per se to repress endogenous glucose synthesis and stimulate glucose uptake. Metformin treatment of obese adolescents with PCOS and impaired glucosetolerance proved beneficial in improving glucose tolerance and insulin sensitivity, in lowering insulinemia, and in reducing elevated androgen levels. Metformin is the only insulin sensitizer that has been evaluated in double-blind RCTs as single medication for adolescent PCOS; metformin use has increased over the last 10 years despite not being licensed for PCOS. A meta-analysis of metformin use with and without lifestyle changes in PCOS up to August 2014 showed beneficial effects on BMI and menstrual cycles. Of the 12 RCTs included, 2 were performed in adolescents. The meta-analysis also highlighted the many limitations of the RCTs such as small sample size, short duration (most trials had duration of 6 months), and a moderate risk for bias.

C. Inositol

Recently, new drugs are being marketed as a novel treatment of PCOS and are gaining more recognition due to their lack of side effects. These are myo-inositol (MYO) and D-chiroinositol (DCI), 2 stereo isomers of inositol, an insulin-sensitizing molecule. Growing evidence suggests that insulin resistance might be induced by an alteration of the metabolism of inositolphosphoglycans (IPG) second messengers and mediators or by a defect in their tissue availability. Many trials demonstrated that MYO administration improves insulin resistance in PCOS patients.

D. Anti-androgens

Antiandrogens mainly act either by competitive inhibition of androgen-binding receptors or inhibit 5-alpha reductase enzyme which decreases androgen production. OCPs should be added with all antiandrogens in sexually active women as there is risk of feminization of male fetus if pregnancy occurs. Two types of anti-androgens are used in the management of PCOS: androgen receptor blockers like spironolactone, flutamide, and the third generation progestin, cyproterone acetate, and inhibitors of 5-alpha reductase such as finasteride, which prevents the conversion of testosterone to DHT. In adolescents with PCOS, direct comparisons of the various anti-androgens or RCTs are not available. Spironolactone is the most commonly used because of its availability and safety profile, with an initial dose of 25 mg/day gradually increasing up to 200 mg/day

E. Spironolactone

One study showed that spironolactone, a steroid chemically related to the mineral corticoid aldosterone, was able to improve insulin sensitivity; ; it also suggested its use for hyperandrogenism associated symptoms such as acne and hirsutism. However, other studies failed to replicate these results. Accordingly, guidelines do not provide any specific recommendations for the use of spironolactone in the management of PCOS; further methodological studies are required to assess any benefit, if existent, for spironolactone in the treatment of this disease. It has been found to be effective for acne and alopecia. Spironolactone is an aldosterone antagonist having action on androgen receptor and 5-alpha reductase inhibitor activity. The dose is 25–100 mg/day, which is generally well tolerated, but symptoms of fatigue, postural hypotension, and dizziness may be experienced by some women. So, start with a low dose (25 mg) and progressively increase over a week. There is a dose-related menstrual irregularity; therefore, it is given in combination with OCP.

F. Flutamide

Flutamide is a non steroidal anti androgen which blocks androgens by competitive inhibition of receptors, reducing androgen synthesis and increasing its inactivation. The dose is usually 250–750 mg/day, but the main concern is hepatotoxicity. have found flutamide with metformin more effective than OCP alone in improving PCOS symptoms. It is effective hirsutism, acne, and alopecia.



G. Cyproterone acetate

It is a presentational antiandrogen which inhibits binding of testosterone and 5-alpha DHT to androgen receptor. It can be used alone in dose of 50–100 mg daily or with combination with ethinyl estradiol in reverse sequential regimen. It has been found to be more effective than finasteride

H. Finasteride

Finasteride is potent competitive inhibitor of the type 2 is enzyme of 5-alpha reductase and blocks the conversion of testosterone to the more active metabolite DHT. It has no effect on DHT receptors or any known effect on steroid biosynthesis. It insulin combination with OCPS and has found to have better results in patients who take OCPs alone.

I. Insulin Sensitizers

Weight reduction drugs may be helpful in reducing hyperandrogenemia, but there is no direct evidence of benefit of met for min on hirsutism or acne. In a study by rosiglitazone was found to have some effect on hirsutism. Metformin would benefit women having insulin resistance or deranged blood glucose levels. [28]

Table 3: Medication used in the treatment of polycystic ovary syndrome in adolescent girls

Table with 4 columns: Medication, Mechanism(s) of action, Dosage, Side effects. Rows include Estroprogestagen OCP, Metformin, Flutamide, Spironolactone, Cyproterone Acetate, and Finasteride.

IV. DISCUSSION

PCOS is identified as a complex syndrome involving reproductive, endocrine, and metabolic disorder, which affects reproductive-age women worldwide and has predominant associations with infertility. The current treatments for PCOS focus on symptom management, such as treatment of obesity, irregular menses and hirsutisms. However, this clinical strategy is short-sighted and limited since increasing evidence links PCOS to a number of metabolic morbidities such as T2DM (type 2 diabetes mellites), obesity, metabolic syndrome, fatty liver disease, and endometrial cancer. Meanwhile, PCOS-related symptoms and complications may result in non metabolic morbidities such as mood disorders (depression, anxiety as examples), social and marital conflicts, thus leading to significant reduction in quality of life. This first global update on the pathophysiology, diagnosis, and treatment of adolescent PCOS is the outcome of an international collaborative effort initiated by Pediatric Endocrine Societies. One aim of this update was to offer a more developmental perspective than previous reports on adolescent PCOS. The authors have attempted to merge many opinions on much evidence, and they realize that there may be apparent inconsistencies between consecutive sections. Hence, this report discloses the many uncertainties and knowledge gaps persisting at the time of writing. There is no effective treatment of PCOS and it is directed only to treat the symptoms of individual patient. There is a genuine need to understand and diagnose this syndrome early so that holistic treatment of this syndrome can be initiated at the earliest, thereby preventing the long-term morbidity. Addressing the endocrine and metabolic deviations, inculcating life-style modifications and involving the use of lasers for hirsutism, forms the mainstay of the management. Preclinical and clinical studies provide preliminary evidence that six herbal medicines may have beneficial effects for women with oligo/amenorrhea, hyperandrogenism and PCOS. The quality of the evidence is variable and strongest for *Vitex agnus-castus* and *Cimicifuga racemosa* in the management of oligo/amenorrhea and infertility associated with PCOS; and *Cinnamomum cassia* for improving metabolic hormones in PCOS.

V. CONCLUSION

Preclinical and clinical studies provide evidence that six herbal medicines may have beneficial effects for women with oligo/amenorrhea, hyperandrogenism and PCOS. However the quantity of pre-clinical data was limited, and the quality of clinical evidence was variable. Further pre-clinical studies are needed to explain the effects of herbal medicines not including this review with current clinical evidence but an absence of pre-clinical data.

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