



Polycystic Ovarian Syndrome

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ABSTRACT: Polycystic ovarian syndrome [PCOS] is a hormonal disorder causing enlarged ovaries with small cysts on the outer edges. Between 5% and 10% of women between 15 and 44, or during the years you can have children, have PCOS. Most women find out they have PCOS in their 20s and 30s, when they have problems getting pregnant and see their doctor. But PCOS can happen at any age after puberty.

Causes: The cause of polycystic ovary syndrome isn't well understood, but may involve a combination of genetic and environmental factors.

Symptoms: The symptoms of PCOS are trouble conceiving or infertility, mood changes, acne, fatigue, insulin resistance, high testosterone levels, male pattern baldness thinning hair, irregular or missed periods, low sex drive, ovarian cysts, weight changes and trouble losing weight, excessive body hair growth, etc.

Diagnosis: PCOS can be diagnosed by androgen excess, ovulatory dysfunction, thyroid dysfunction, hyperandrogenism, hyperandrogenemia, menstrual cycle irregularity, ovarian dysmorphology.

Treatment: The treatment of PCOS can be done by healthy eating, exercising and losing weight, blood sugar controlling, reducing stress and anxiety, anti - inflammatory treatment, eliminating toxins, taking vitamins, etc.

Pathophysiology: The complex Pathophysiology of PCOS involves the interaction of genetic and epigenetic changes, primary ovarian abnormalities, neuroendocrine alterations, and endocrine and metabolic modifiers such as anti-Mullerian hormone, hyperinsulinemia, insulin resistance, adiposity, and adiponectin levels. There are several herbal formulations which help in reducing cysts formed due to PCOS.

INTRODUCTION

Anovulation, elevated androgen levels and presence of multiple ovarian cysts on USG findings is the basis of diagnosis of PCOS.⁽¹⁾ Obesity, amenorrhea and hirsutism are the most common signs and symptoms of this condition.⁽²⁾ A common endocrine disorder that has profound implications for a woman throughout her reproductive years is PCOS.⁽³⁾ Association with an early age at puberty, subsequent menstrual problems commencing in adolescence, reduced fertility due to ovulatory disorder, an increased predisposition to miscarriage, and pregnancy – related complications when the woman conceives, and there may be metabolic implications for the woman in later life may be the diagnosis of PCOS.⁽⁴⁾ As the definition of PCOS has evolved with time an accurate prevalence of the condition can't be obtained using different diagnostic criteria but 14% reproductive aged women are believed to have this condition.⁽⁵⁾

Cardiovascular metabolic end-points have been focused on small, self-selected population to address the long term consequences of PCOS.⁽⁶⁾ The cardiovascular end-points of late-onset diabetes, obesity, hypertensive disorder, ischemic heart disease, and cerebrovascular disease which is suggested by the studies. Women with an adverse cardiovascular risk are more related to insulin resistance than the presence of

PCOS.⁽⁷⁾ Signs of altered vascular compliance and endothelial function have been signs of young overweight women with PCOS.⁽⁸⁾ Women with PCOS have a greater prevalence of type 2 diabetes who were admitted to the hospital.⁽⁹⁾ Women without PCOS are not more prone to a greater degree of emotional distress. Emotional distress, depression, anxiety disorder and self harm are at an increased risk in women with PCOS.⁽¹⁰⁾

A hyperandrogenic disorder associated with chronic oligo-anovulation and polycystic ovarian morphology is PCOS.⁽¹¹⁾ The major factors responsible for altered androgen production and metabolism are recognized to be often associated with psychological impairments, including depression and other mood disorders and metabolic derangements, chiefly insulin resistance and compensatory hyperinsulinaemia.⁽¹²⁾ The result of adrenal and ovarian secretion and conversion from precursors in peripheral tissues, particularly the adipose tissue and skin is androgen production rate (PR) in normal women.⁽¹³⁾ In obese PCOS women it was shown that testosterone MCR was higher, whereas with respect to normal weight affected women whereas MCR of androstenedione was marginally different as well as in PCOS women there is body influenced testosterone MCR. There is evidence that in women with simple obesity, those with abdominal fat distribution have higher testosterone PR, but not higher androstenedione, with respect to those with the peripheral phenotype although there are no studies in PCOS women with different obesity phenotypes.⁽¹⁴⁾ The accurate measurement of androgens and particularly testosterone is one of the main problems in the diagnosis of hyperandrogenic states such as PCOS.⁽¹⁵⁾

Though the adrenal cortex accounts for the synthesis of DHEA and dehydroepiandrosterone sulphate (DHEAS) and that of androstenediol and 11 β -hydroxy androstenedione, it has been accounted that 25% of androstenedione and testosterone production is of ovarian origin, 25% is of adrenal origin and 50% is produced in peripheral tissues.⁽¹⁶⁾ Oestrogen biosynthesis which starts to decrease 3-4 years before menopause in women for which androgens serve as the precursor.⁽¹⁷⁾ The decrease in adrenal androgens can be observed after the age of 30 years while basal serum levels of ovarian androgens decrease only slightly and remain relatively stable until menopause.⁽¹⁸⁾ Women with PCOS have increased sympathetic and decreased parasympathetic components as it is shown by the studies using indirect markers of autonomic function – heart rate variability and heart rate recovery after exercise.⁽¹⁹⁾ High general activity in the sympathetic nervous system having relevancy to the pathophysiology of the syndrome was demonstrated in women with PCOS. The explanation of high sympathetic activity in women with PCOS proved testosterone to be the strongest independent factor.⁽²⁰⁾

The type and extent of lipid abnormalities in PCOS have independent and interrelated effects on body fat amount and distribution, presence and degree of insulin resistance, and androgen excess.⁽²¹⁾ Improved serum androgen in adolescent diagnosed with PCOS demonstrate the induction of modest weight reduction, with or without concomitant oral contraceptive.⁽²²⁾ Hyperandrogenism, polycystic ovaries and ovulatory dysfunction are the three main phenotype characteristics of this condition.⁽²³⁾ The most common cause of anovulatory infertility in women is because of PCOS.⁽²⁴⁾ Evidence of both environmental as well as genetic factor play a role in etiology though there are no cause of PCOS.⁽²⁵⁾

In the past decade the origin and pathological cause of PCOS was in much debate. A defect in insulin action may be the primary cause of PCOS as indicated by many studies.⁽²⁶⁾ The pathogenesis of PCOS is shown to play a role by environmental factors. The role of socio-economic status (SES) and unhealthy behavior, including smoking, poor diet and lack of exercise have been observed by several studies as a cause of PCOS.⁽²⁷⁾ High rate of co-morbidity in PCOS has a common association with low SES which is obesity.⁽²⁸⁾ Two of the three phenotypes to be diagnosed as having PCOS is displayed by the patients. With

upto 95% if women with PCOS experincing some type of anovulation which is the most common phenotype⁽²⁹⁾ Approximately 60% of patient have hyperandrogenism as another persistent diagnostic PCOS.⁽³⁰⁾

The risk of cardiovascular complication are strongly correlated with the high level of CRP.⁽³¹⁾ Those women who experience worsened metabolic phenotype were the ones having 72.8% low level of vitamin-D.⁽³²⁾ More fat storage and a decreased appetite is caused by an increased insulin resistance in these women.⁽³³⁾ The association with the presence of insulin resistance, obesity, diabetes mellitus type 2, dyslipidemia, metabolic syndrome, hypertension, cardiovascular disease ,hyperplasia and endometrial carcinoma though it has specific pathophysiology of has not yet been established .⁽³⁴⁾ The causes of a complex multigenic disorder including abnormalities in the hypothalamic pituitary axis steroidogenesis and insulin resistance though the etiology of PCOS is not yet completely known.⁽³⁵⁾ Increased estrogen levels, menstrual irregularity and infertility are the results of excess androgen changes in the regulation of female hormones.⁽³⁶⁾

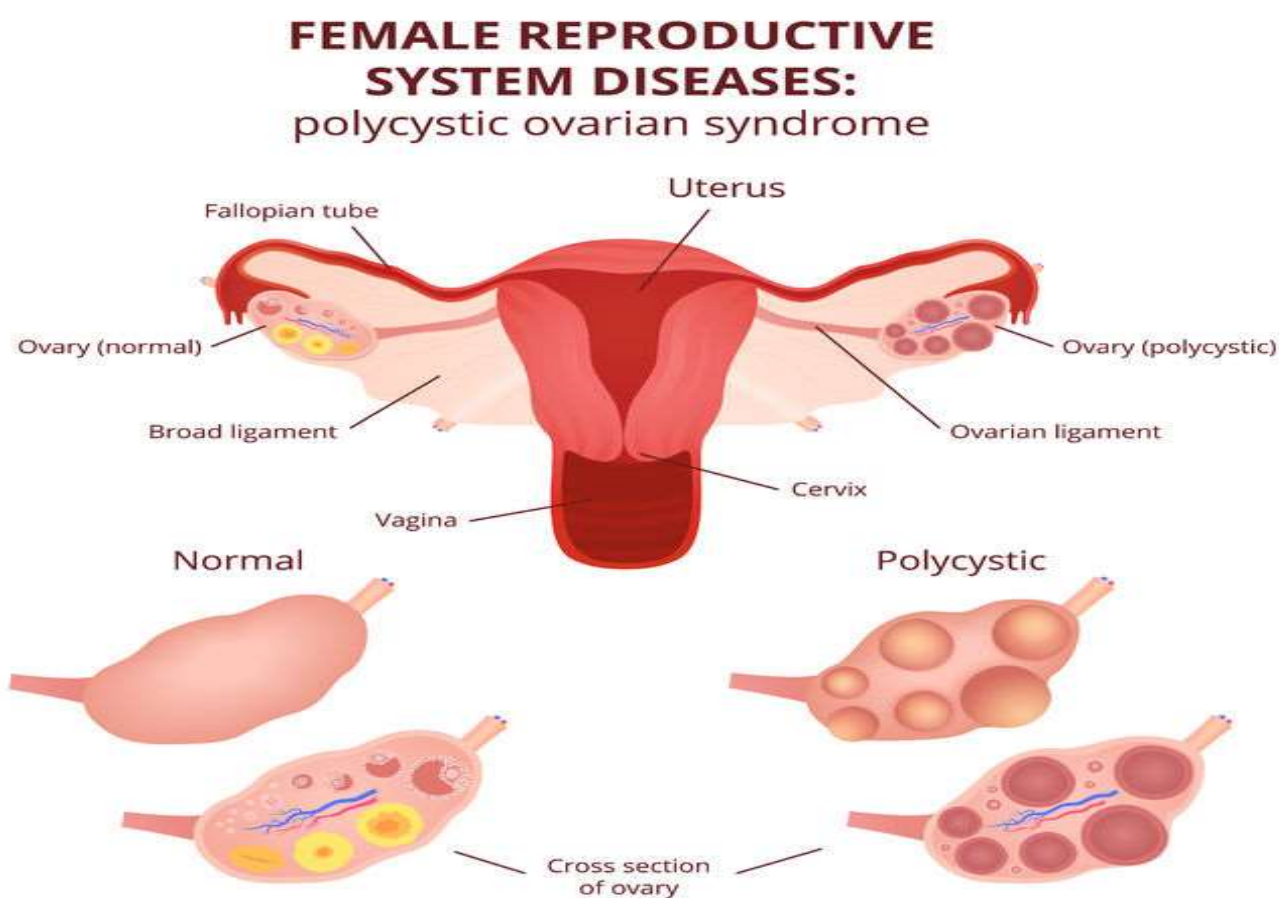
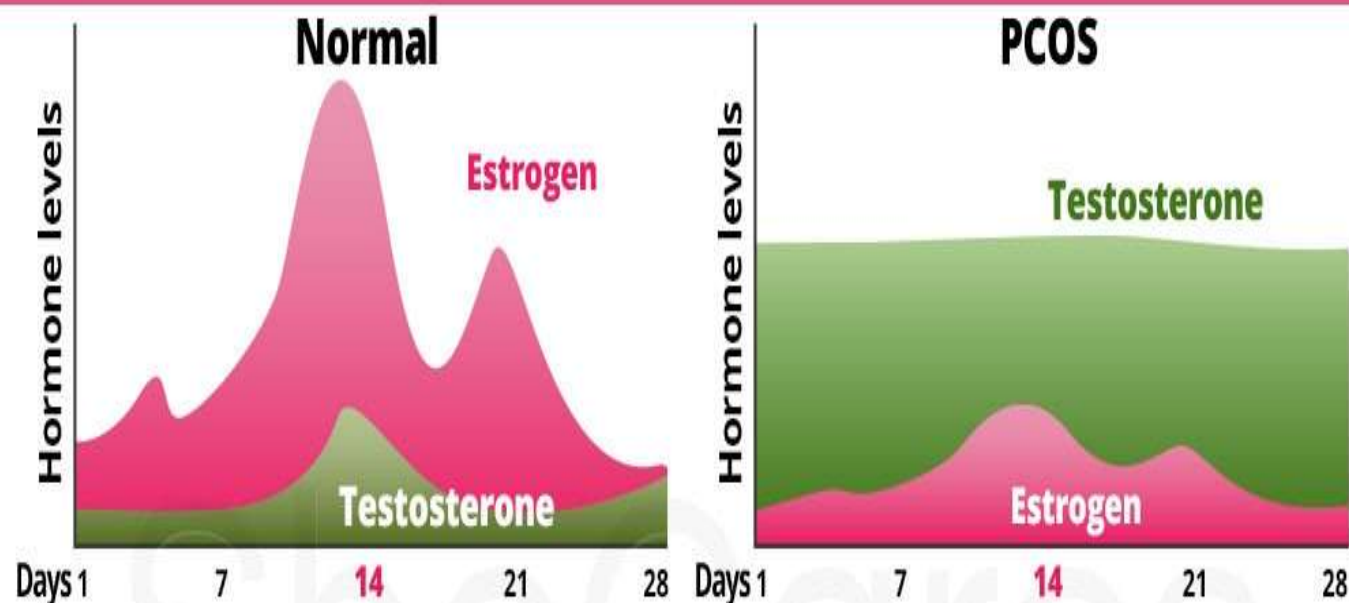


Fig 1. It's time to rename Polycystic Ovarian Syndrome⁽³⁷⁾

Causes:

Causes of PCOS



Most Common Cause:

Rooted in hormonal imbalance:

- **EXCESS ANDROGENS** (testosterone) disturb ovulation
- **EXCESS INSULIN** triggers ovaries to make more androgens

Other Causes:

- **GENETICS:** Women whose relatives had PCOS are more likely to have it, too.
- **INFLAMMATION:** It can lead to increased androgen levels in the body.
- **LIFESTYLE FACTORS:** Poor diet and smoking may lead to obesity and insulin resistance, both linked to PCOS.

SheCares

Fig. 2 Causes Of PCOS⁽³⁸⁾

A multifactorial disease is PCOS. The pathophysiology of the disease is attributed to several susceptible genes. Various levels of steroidogenesis and androgenic pathways include these genes. 70% heritability is estimated by twin studies. A fundamental component in the expression of these genes and the development and progression of the disease is environment.⁽³⁹⁾

The expression of PCOS features has been due to individuals with a genetic predisposition exposed to certain environmental factors according to two hypotheses. Obesity and insulin resistance are the most common environmental factors included in PCOS. Fetal androgen exposure is the cause according to many Hypotheses.⁽⁴⁰⁾

Symptoms:



Fig 3. Signs Of PCOS⁽⁴¹⁾

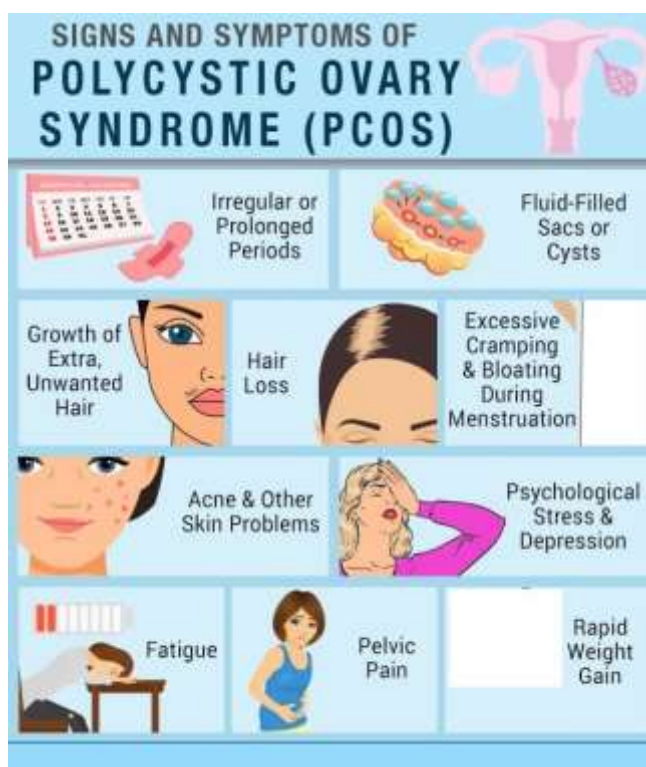


Fig 4. Symptoms of PCOS⁽⁴²⁾

Irregular menstrual cycle: Missing periods or having fewer periods (fewer than eight in a year) are experienced by women with PCOS. Or, repetition of periods every 21 days or more often is also a symptom. Stopped menstrual periods in some women is also a characteristic.

Too much hair on the parts where men usually have hair such as face, chin, or other parts which is termed as hirsutism. Upto 70% of women with PCOS are affected by hirsutism.⁽⁴³⁾

Face, chest and upper back having acne.

Male pattern baldness that is thinning hair or hair loss on scalp.

Weight gain or difficulty losing weight.⁽⁴⁴⁾

Darkening of skin along neck creases, in the groin, and underneath the breasts.

Small excess flaps of skin in the armpits or neck area also called skin tags.⁽⁴⁵⁾

Ovaries being large and having many cysts.

Infertility⁽⁴⁶⁾

Pathophysiology:

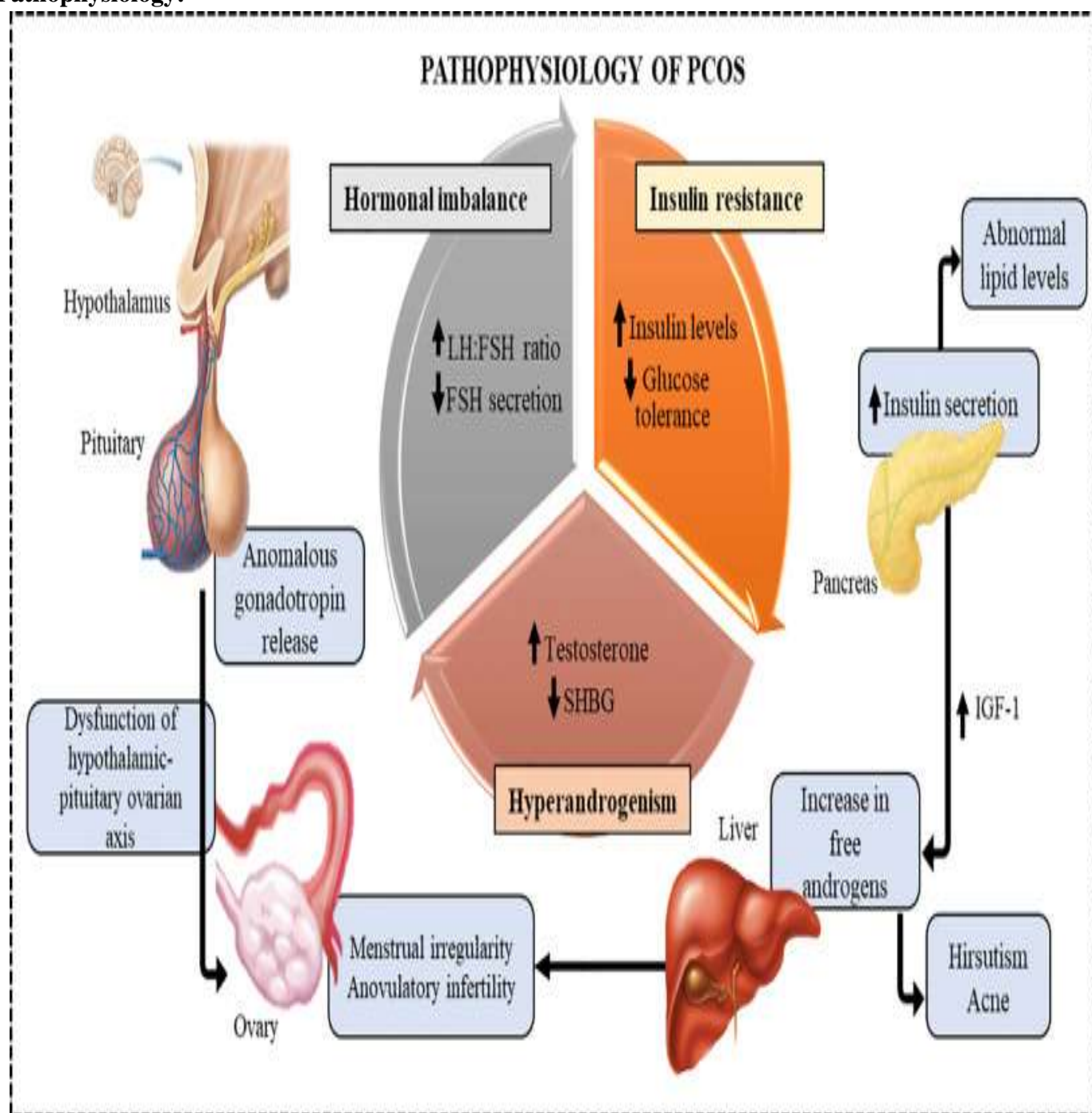


Fig 5. Pathophysiology of PCOS⁽⁴⁷⁾

5-7% of women of child bearing age is affected by PCOS.⁽⁴⁸⁾ and menstrual dysfunction, evidence of androgen excess, and metabolic disturbances have a close association.⁽⁴⁹⁾ Although all patients require hyperandrogenism and menstrual dysfunction the phenotypic expression of the disorder is quite variable.⁽⁵⁰⁾ The presence of enlarged polycystic ovaries seen at the time of surgery in association with oligo/amenorrhea and hyperandrogenism was initially defined pathologically as PCOS.⁽⁵¹⁾

Treatment:



Fig 6. Ayurvedic Treatment of PCOS⁽⁵²⁾

An adjuvant therapy of hirsutism and polycystic ovary syndrome is liquorice.⁽⁵³⁾ Antiandrogen properties are possessed by spearmint.⁽⁵⁴⁾ Toxins are flushed out, menstrual cycle is regulated and hormonal balance is caused by amla.⁽⁵⁵⁾ Blood sugar levels are balanced, being an incredible feat in managing metabolic syndrome in PCOS is shown by ashwagandha.⁽⁵⁶⁾ Improvement in changes of female sex hormones by reducing the concentration of estrogen, free testosterone, and andrestandion hormones in patients with PCOS is shown by consumption of pomegranate.⁽⁵⁷⁾ Reduction in androgen levels and hirsutism is attributed to fennel seeds.⁽⁵⁸⁾

Statistics:

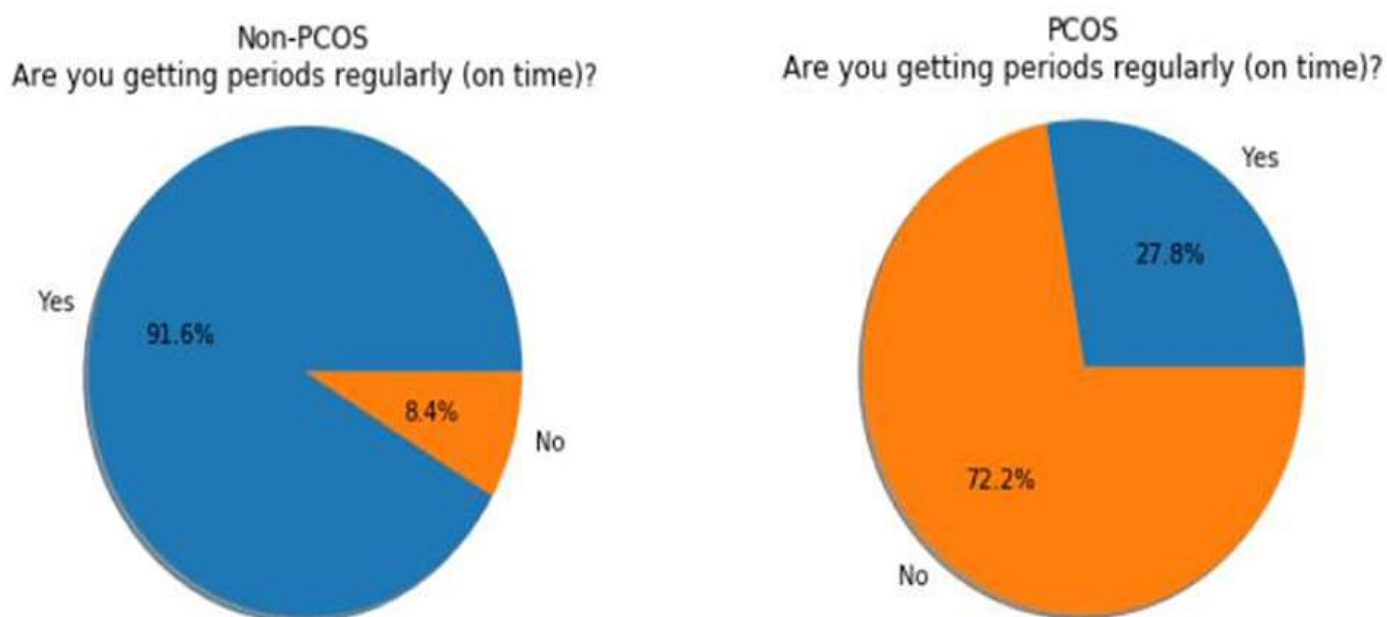


Chart 1: Prediction of PCOS⁽⁵⁹⁾

An area of artificial intelligence that has been a key component of digitalization solutions that has caught major attention within the digital arena is predominantly caused by machine learning.⁽⁶⁰⁾ Many women are able to conceive using the right treatment. But poorly diagnosed women comprise 50% of women and many women are left undiagnosed.⁽⁶¹⁾

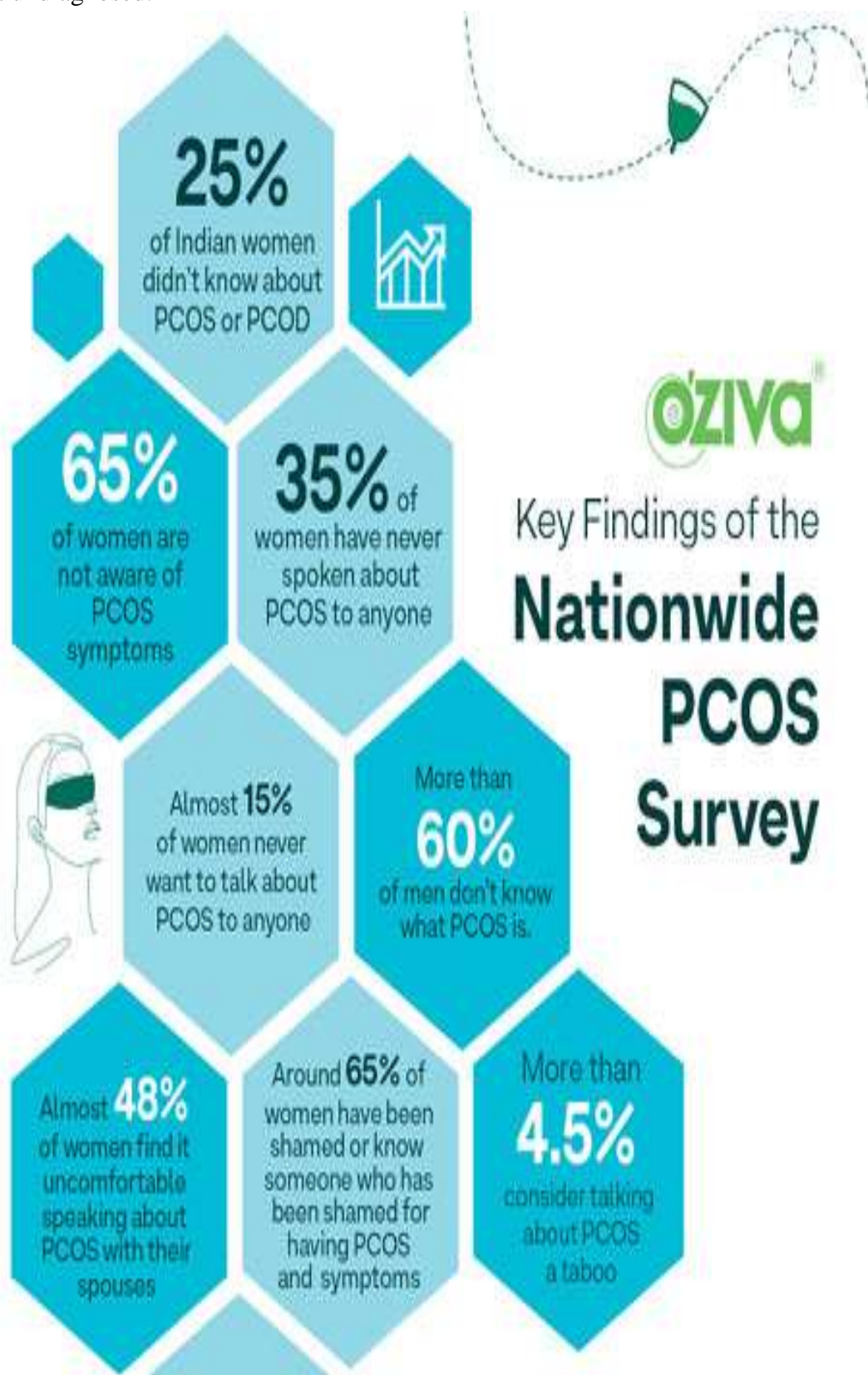


Chart 2. Ratio Of Occurrence in India⁽⁶²⁾

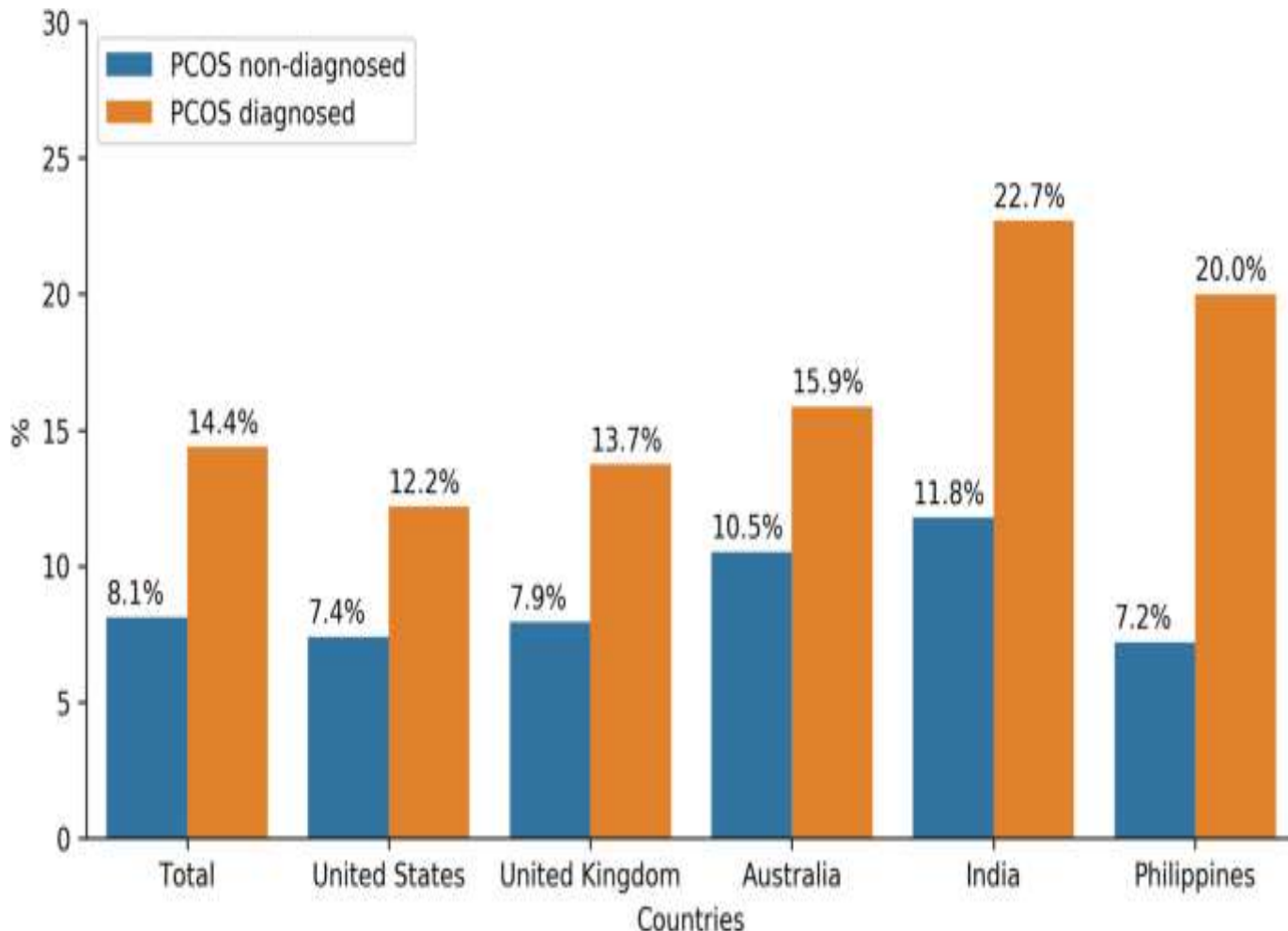


Chart 3. Ratio of Occurrence worldwide⁽⁶³⁾

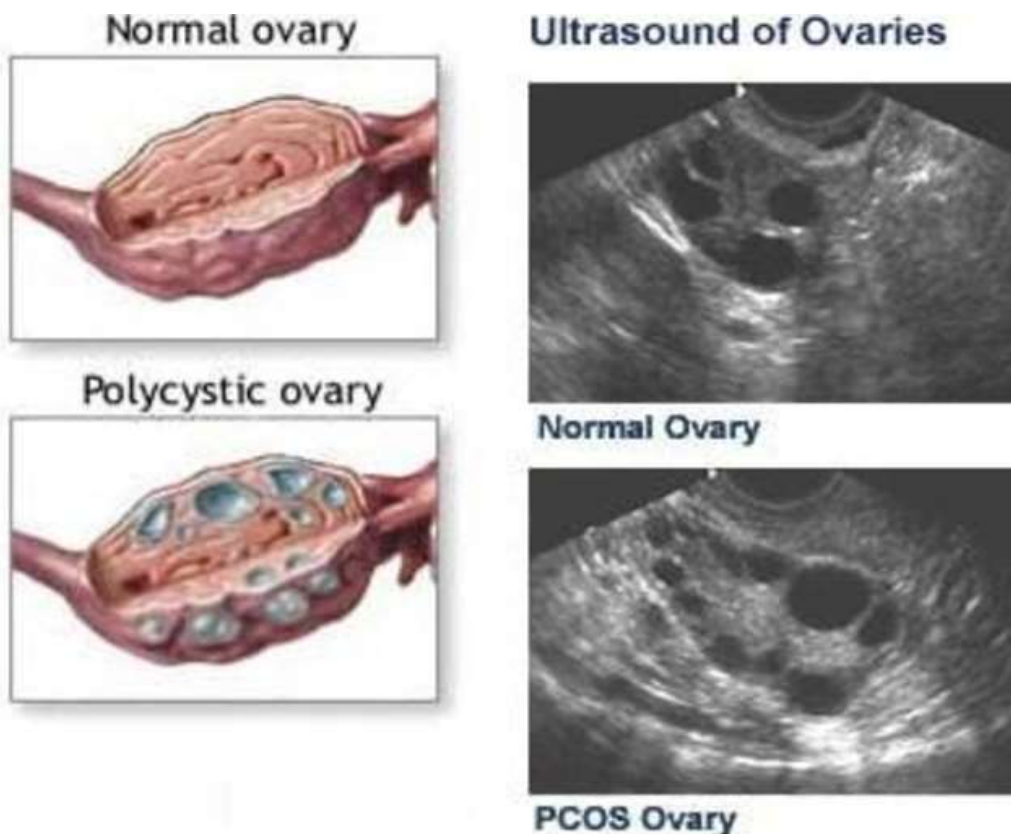


Fig 7. Normal VS. Polycystic Ovary (Realistic Ovary)⁽⁶⁴⁾

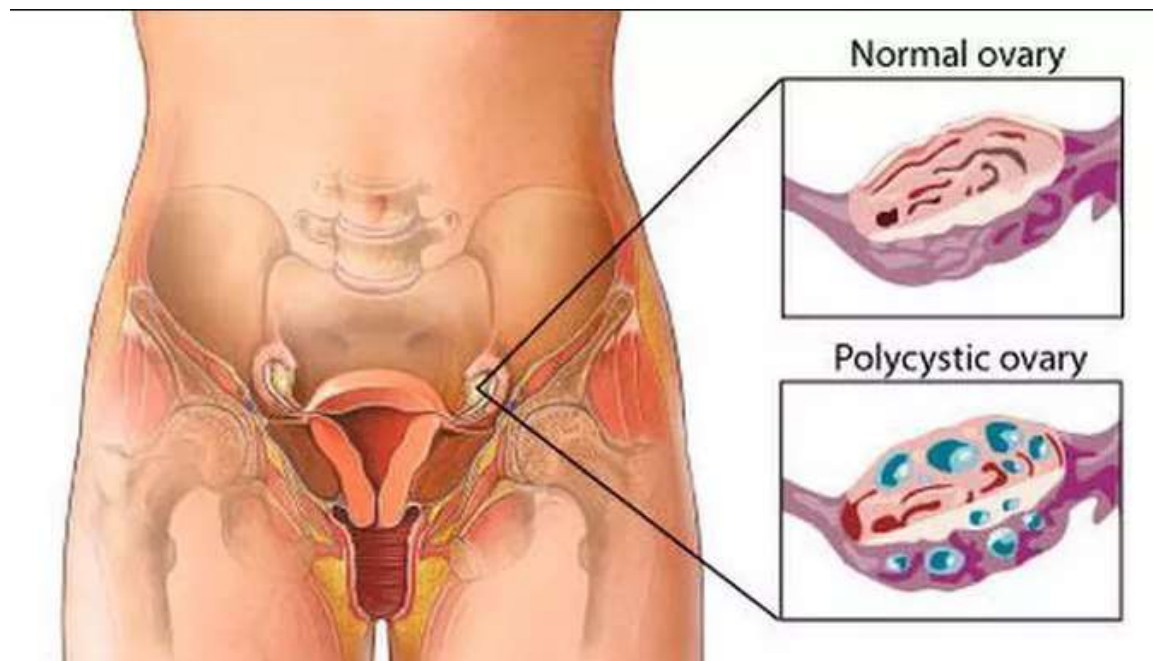


Fig. 8 Polycystic Ovary⁽⁶⁵⁾

Relation of PCOS with Menstrual Cycle:

Higher androgen and lower sex hormone binding globulin levels (SHBG) has been associated with longer menstrual cycle length and irregular cycles.⁽⁶⁶⁾ Though the combination of MI and metformin had similar effects on treatment of weight, BMI, waist and hip circumference it showed better effect on menstrual cycle.⁽⁶⁷⁾ Thus, menstrual cycle and PCOS are closely related.

Thus, PCOS is an extremely relevant topic which needs research to be done on it. Among women of reproductive age with lifelong complications, PCOS is becoming a more prevalent disorder. Its ambiguous diagnostic criteria and vast complexity of characteristics is one of the most challenging aspects. To determine preventative risk factors as well as successful treatment modalities for this syndrome, the need of more research in the genetics and pathophysiology of PCOS.

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