Polycystic Ovarian Syndrome (PCOS)

What is Polycystic Ovary Syndrome (PCOS)?

This is a common endocrine condition with a wide spectrum with women noting some or all of the features described below:

- Irregular menstrual cycles. Pain is not a feature of PCOS
- Weight Gain (However, 2 out of 10 of those with PCOS are not carrying excess weight)
- Signs of androgen (testosterone) excess: Increased facial/body hair, acne, scalp hair loss
- PCOS often starts around puberty but make take a few years to be diagnosed.

PCOS is sometimes also known as Polycystic Ovarian Disease (PCOD).

Small cysts (not painful or cancerous) may be seen on one or both ovaries and may be responsible for a variety of symptoms. It is important to remember that not all women will have all symptoms and signs of PCOS, even if they have the condition.

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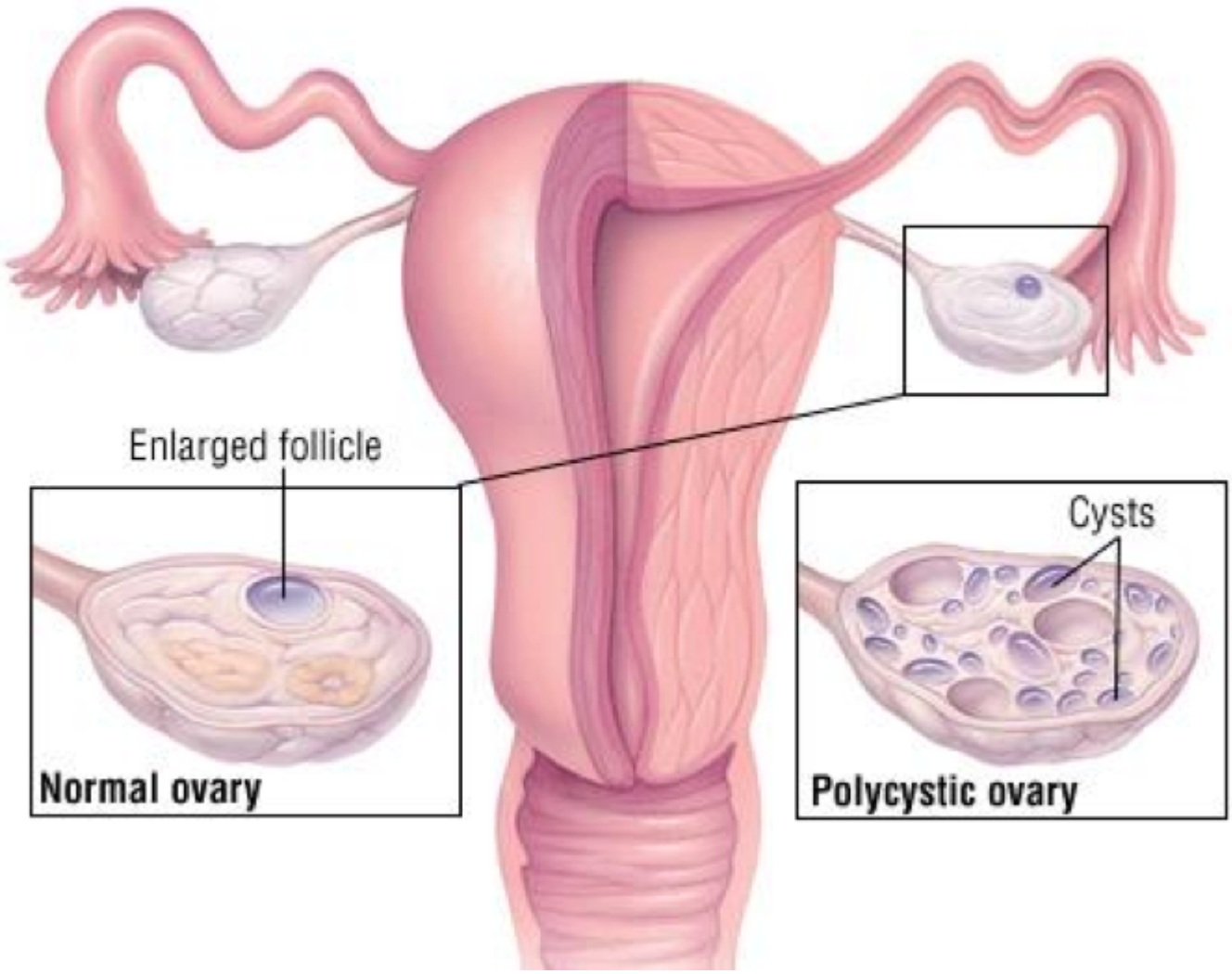

Medical Definition of PCOS requires 2 of 3 of the following criteria:

- Oligo –and/or anovulation (not producing eggs on a regular basis)
- Hyperandrogenism (clinical symptoms as a result of increased androgens (testosterone) and/ or abnormal biochemical (lab tests)
- Polycystic ovaries (>12 or more follicles measuring 2 –9mm in diameter and/or increased ovarian volume on pelvic ultrasound scan.

(2003 ASRM/ESHRE Rotterdam PCOS consensus workshop)

Polycystic Ovarian Syndrome (PCOS)

How common is PCOS?

PCOS is an extremely common problem, with approximately 20% (2 in 10) of women in the reproductive age group showing signs of polycystic ovaries on a pelvis ultrasound scan. 10% (1 in 10) of women will have clinical symptoms or biochemical evidence of PCOS. There appears to be a 3-10 % prevalence in the general population with the condition being diagnosed as much as 30% in women with obesity. There be appeared to be ethnic variations, but this has not been confirmed in recent studies.

There is a higher incidence in subfertility populations compared to women who have had children.

There appears to be a complex genetic trait, similar to heart disease, type 2 diabetes and the metabolic syndrome, where multiple genetic variants, metabolic and environmental factors interact to foster the development of the disorder. Twin studies and study of first-degree relatives have suggested these links.

As much as 50-75% of people with PCOS may be undiagnosed.

Onset may start around puberty in some situations and is known as adolescent PCOS.

What causes PCOS?

This is still a poorly understood condition. The most likely explanation is that the ovary makes an excess of testosterone, either spontaneously with no external drive (ovarian dysfunction) or as a result of the action of insulin (reduced insulin sensitivity in peripheral tissues, leading to increased levels of insulin. Insulin resistance is the driver it appears in 50%-70% of people with PCOS and insulin itself stimulates the ovaries to produce excess androgens

It is thought that excess weight itself may be a trigger. More than half of those living with PCOS carry excess weight and it is unclear whether increased body weight causes PCOS or vice versa. Over a third of lean PCOS carry increased intra-abdominal fat. There appears to be a genetic predisposition for putting on excess weight, especially in teenage years in those with PCOS.

There may be a genetic predisposition (Polygenic) (Type 2 DM, premature hair loss in male relatives) and the condition can also run in families.

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PCOS is affected by lifestyle factors and diet, which in turn influence body weight, insulin resistance, inflammation, oxidative stress and androgen activity

What are the signs and symptoms of PCOS?

- Infrequent periods or missed periods (Oligomenorrhoea/Amenorrhoea)
- Excess facial/body hair (Hirsutism)
- Acne
- Acanthosis Nigricans (darkened skin: behind the neck, underarms, groin)
- Weight gain
- Scalp hair loss (Alopecia)
- Fertility problems
- Eating disorders
    - Ask specifically for disordered eating as this may be missed especially in those from different ethnic groups.
    - Referral to a dietician or another specialist (endocrinologist/dermatologist) may be indicated for some women.
- Excessive daytime sleepiness
- Breathing problems (Sleep Apnoea)
- Psychological issues such as depression and anxiety should be addressed
- Mood disorders and sleep disturbances are now regularly associated with PCOS
- Pain is not a feature of PCOS.

Symptoms of PCOS can range from weight gain to fertility problems. The most common symptoms are unwanted hair growth, acne, irregular periods, and a failure to ovulate. Half the people with PCOS will be of excess weight carrying more weight around the middle, although the condition is also seen in women of normal body weight.

Increased risk of psychological and behavioural disorders as well as reduced quality of life have been noted in those living with PCOS. Higher risk of eating disorders and sexual and relationship dysfunction have also been seen in PCOS sufferers compared to the general population. It is important to ask and screen for these psychological issues, especially depression, as per NICE guidelines.

Will I have problems having a baby?

Fertility problems in PCOS usually arise from not releasing eggs from the ovaries (anovulation). Not all women have this problem of anovulation. Losing weight and following

a healthy lifestyle, if carrying excess weight, will significantly improve fertility chances. There are treatments available for most people with PCOS, but some women will need to see a fertility specialist.

Studies have shown infertility to be higher in women reporting PCOS with greater use of fertility hormone treatment. However, poor data is available for successful spontaneous pregnancy outcomes. However, people with PCOS can be counselled on their likelihood for live birth with front-line infertility therapy using the following clinical parameters: BMI, age, duration of attempting conception, and hirsutism score.

Those living with PCOS should seek medical advice after 6 months of trying for a pregnancy and not wait for the 12-18 months that is advised to other young couples with no risk factors.

Is there a link between disordered eating and PCOS?

It is important for health care professionals to recognise eating disorders in PCOS sufferers. People with PCOS have been shown to have higher prevalence of eating disorders such as binge-eating disorder and bulimia nervosa. These often go unrecognised and usually not been considered so the patient never gets asked. The focus is often just on weight and physical symptoms which means mental health gets overlooked.

Eating disorders may not be picked up as often in people with PCOS of different ethnicities and higher body weights. Other symptoms that can complicate the situation in those with PCOS are sexual dysfunction and obsessive-compulsive behaviours, which in turn can lead to lower self-esteem and to disordered eating.

Health care professionals who understand the various mental health barriers in PCOS can make help patients truly achieve long term success with managing their condition from all its aspects. By involving the patient in decision making regarding their treatment, taking the time to listen and asking pertinent questions to help address and recognise the more unusual symptoms of PCOS with consideration of early referral to a therapist in appropriate situations can be very gratifying.

As there is a higher risk of disordered eating in people with PCOS, restrictive diets such as low carb diets or low-fat diets potentially can be triggering for some, even if they achieve the weight loss goal. Even a plant-based way of eating if not explained correctly may hinder management if underlying mental health issues and eating disorders not explored or addressed. Proper medical nutrition planning by qualified dieticians and nutritionists with a

special interest in PCOS can be invaluable.

How is PCOS diagnosed?

Your doctor will take

- Detailed history including medical and obstetric history.
- Measure your BMI (Body Mass Index), body weight, height, waist size and blood pressure.
- An internal examination is not needed to diagnose PCOS.
- Appropriate scans and blood tests will help confirm the diagnosis.
- A pelvic ultrasound scan often shows tiny cysts on one or both ovaries, which are both painless and non-cancerous (“String of pearls” appearance on scan)

On examination:

- Some with PCOS will carry weight around the middle, have a BMI >27kg/sqm although 2 out of 10 with PCOS will have a normal body weight.
- Your doctor will ask for unusual symptoms of Galactorrhoea (nipple discharge), Hirsutism – increased facial/male pattern hair and male pattern of hair loss (Alopecia)
- Rarely there may be signs of virilism (change in voice, male pattern of hair and clitoromegaly)
- Differential Diagnosis: In some situations, other conditions such as Androgen Secreting Ovarian Tumours, Hyperprolactinaemia, Thyroid Disease, Late onset Congenital Adrenal Hyperplasia, Cushings Syndrome and Adrenal Dysfunction may mimic PCOS.

What tests will be recommended for PCOS?

Investigations to diagnose PCOS include a pelvic ultrasound (characteristic `string of pearls` appearance) and blood hormone levels which typically show elevated testosterone and luteinising hormone levels. However, a third of those with PCOS may have normal ultrasound or hormone levels. Other tests include fasting glucose lipids and triglyceride levels.

Blood tests may have to be done after fasting for 12 hours and timed with your menstrual cycle, if you are having periods. For women who are not sexually active, the pelvic scan is not an internal scan and is done by scanning the abdomen (tummy). It is not a painful

procedure. These tests help to confirm the diagnosis of PCOS and rule out other rarer conditions that may cause similar symptoms.

What is the treatment for PCOS?

The aim of the medical consultation is for the patient to understand the condition better and receive the right advice. The diagnosis is confirmed with the help of a thorough history from the woman and appropriate scans and tests. Management and treatment are based on individual patient needs and combines lifestyle changes and advice, with or without medication.

Lifestyle changes is the key to managing PCOS and its symptoms, both in the short term and longer term. Losing weight under guidance will often result in many of the symptoms getting better, especially menstrual problems. Once a diagnosis of PCOS is made, women should be counselled about the possible long-term risks. Siblings should also be offered advice concerning detection and management of PCO syndrome.

Treatment must be on an individual basis and may be best decided with help of a specialist.

- Lifestyle Changes is the key to managing PCOS and its symptoms.
- This should be the first line of treatment to manage PCOS. Lifestyle changes help by reducing insulin resistance and restoring hormonal imbalance. *See lifestyle medicine and nutrition leaflets.*
- Weight loss strategies: should be offered before any medical treatment, especially to people who are carrying excess weight with anovulation (infrequent periods), as even losing as little as 5%-10% of body weight can see a return in normal ovulatory cycles and improved pregnancy rates.

Weight loss and obesity management through lifestyle changes (diet, exercise and behavioural changes) should be the first line of therapy and can help with all symptoms of PCOS.

Weight loss results in a decrease in serum androgen concentrations and, in some, improvements in hirsutism

Responsiveness to weight loss in people with PCOS who are carrying excess weight varies considerably and more than one third of women may achieve full recovery.

- Lifestyle intervention improves body composition, hyperandrogenism (high

testosterone and clinical effects) and insulin resistance in people with PCOS.
- No specific dietary composition has been demonstrated to be most beneficial, in part because of clinical heterogeneity and methodological problems with the current body of research
- A nutritionally adequate weight loss diet based on healthy food choices was of clinical benefit in people with PCOS carrying excess weight, regardless of the diet composition.
- However, given the commonality of PCOS with Type 2 diabetes, women should be advised to focus on a predominantly whole food plant based way of eating as these foods are full of fibre and micronutrients that are wholesome and absorbed slowly keeping blood sugars normal. We know this works very well in men and women with Type 2 diabetes and also the metabolic syndrome.
- Eat a varied whole food plant-based diet for e.g. beans, peas, lentils, vegetables, fruits, intact whole grains, herbs and spices. Aim to get your healthy fats from whole foods sources such as a handful of nuts, seeds and from avocados. Keep oil consumption to a minimum, especially if weight loss is desired, as oils are calorie dense and devoid of fibre and relatively low in micronutrients. Use salt, sugar and small amounts of oil such as EVVO (Extra Virgin Olive Oil) for flavouring purposes rather than over consuming. Also, make water your drink of choice.
- Eating a fibre rich plant based diet helps promote healthy gut bacteria and helps to reduce inflammation and oxidative stress, normalises blood sugars and reduces insulin resistance.

Oxidative stress, inflammation and the role of AGEs in people with PCOS:

AGEs (advanced glycation end products) or glycotoxins are highly reactive molecules thought to accelerate the aging process. AGEs crosslink proteins together, causing tissue stiffness, oxidative stress, insulin resistance, cellular damage and inflammation.

AGEs are produced internally as natural waste products of metabolism, but the other source is from our diet (foods especially when cooked at high temperatures).

Those with PCOS tend to have nearly twice the circulating AGE levels in their bloodstream.

People with PCOS also tend to have higher levels of AGEs and AGE receptors in the ovaries. So, ovaries may be particularly sensitive to their effects, with AGEs contributing to the cause of PCOS. High AGE levels were found in lean people with PCOS as well.

Diets low in AGEs reduce inflammation and insulin resistance in people with PCOS while

high-AGE foods include beef, pork, poultry, cheese, butter, cream cheese, and processed snack foods.

Low-AGE foods include whole grains, legumes, vegetables, and fruits.

Increasing intake of foods that may help pull AGEs out of the body like brown rice and mushrooms.

Eat foods high in antioxidants like berries, herbs, and spices.

Dietary AGE intake can be decreased by changing the method of cooking from the high temperature dry cooking methods to low heat, higher humidity (stewing, steaming, and boiling).

Choose raw foods (fruits, vegetables, raw nuts and raw nut butters, the latter may have 30 times less AGEs compared to the roasted nuts)

The impact of dietary modification of AGEs on the hormonal and metabolic profile of people with PCOS was reported and modifications of dietary AGE intake was associated with parallel changes in serum AGEs, metabolic, hormonal and oxidative stress biomarkers in people with PCOS. These novel findings support recommendations for a low AGEs dietary content along with lifestyle changes in people with PCOS.

- Avoid trans fats, oils, junk and ultraprocessed foods, carbonated drinks, fruit juices, sugary foods such as cakes and biscuits, as these cause surges of insulin and blood sugar. They are all devoid of fibre and promote oxidative stress and inflammation. Stay away from high AGE ultra-processed foods, such as puffed, shredded, and flaked breakfast cereals and fried foods
- Avoid animal derived foods including eggs, dairy, fish, chicken and red meat. These are full of saturated fat, devoid of any fibre and promote inflammation through the various compounds that are naturally present in animal foods, including TMAO, carnitine, Neu5GC as well as bacterial endotoxins, antibiotics, plastic, persistent organic pollutants and mercury (the latter two particularly in big fish)
- Avoid risky substances including smoking and alcohol, both of which make PCOS symptoms worse similar to processed meat. The glycotoxins in cigarette smoke “may contribute to” the increase of heart disease and cancer among smokers.
- Exercise: Aerobic exercise and weight resistance exercise including high intensity interval training are all recommended to help with hormone balance and improves insulin sensitivity in those living with PCOS. Aim for 300 minutes of exercise per week

(approximately one hour/day)
- Sleep and mood: Ensure a good night's sleep of 7-9 hours, identify and avoid stressful situations.
- Stress management: Consider exercise, meditation, mindfulness, community work, psychotherapy and yoga to help manage stress.

Management options for PCOS, apart from diet and exercise include the use of oral contraceptive pill, insulin sensitising agents (Metformin), fertility treatment and laparoscopic ovarian drilling. Treatment must be individualised and monitored carefully. There are several medications that can be used to manage PCOS, but this will need to be individualised to each patient.

- Treating excess hair growth: Removal of excess hair and treatment of acne with skin care or medications, either with help of GP or skin specialist.
- Local depilatory methods such as threading, waxing, tweezing, bleaching, electrolysis and laser treatment are all very effective in removal of excess hair for most women.
- The Combined Oral Contraceptive Pill (COCP) is safe and ideal for younger women who want to regulate their cycles and don't want to get pregnant, helps with reducing unwanted hair and acne.
- Psychological issues such as depression and anxiety should be addressed.
- Referral to a dietician or another specialist (endocrinologist/dermatologist) may be indicated for some women.
- Insulin sensitising drugs (Metformin) may be used under specialist guidance.
- Fertility drugs and/or assisted conception techniques may be needed for some.
- Keyhole operations may help some women conceive (laparoscopic ovarian drilling).

When to use Metformin?

- At least 2 out of 3 features of PCOS (USS, biochemistry, clinical)
- Anovulation (not producing eggs regularly)
- BMI > 27 or putting on weight
- In a controlled setting
- Not for longer than a year without specialist review
- Ovulation/lipid profile check 2-3/12

Myoinositol with folic acid for 3-6 months has shown some promising results in helping women ovulate and is thought to work by reducing testosterone/insulin levels.

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When should your GP consider referral to a specialist:

- Infertility
- Rapid onset Hirsutism
- Glucose intolerance/Diabetes
- Amenorrhoea for >6/12
- Serum Testosterone>5nmol/l to r/o other causes of androgen excess
- Refractory symptoms
- Diagnosis in doubt

Are there any long-term implications of PCOS?

- There appears to be an increased risk in people with PCOS carrying excess weight of the conditions listed below. The key underlying abnormality that leads to long term problems appears to be insulin resistance. Raised insulin levels (hyperinsulinaemia) in the presence of normoglycemia (normal blood sugars) are often noted.
- Gestational diabetes (Diabetes in pregnancy). The prevalence is twice as high among people with PCOS vs control (A glucose tolerance test GTT is recommended for those with PCOS during pregnancy).
- Adult onset (non-insulin dependent) Type II diabetes. 10-20% risk and higher risk with truncal obesity and family history of diabetes also increases risk.
- Insulin Resistance
- Metabolic syndrome (impaired glucose tolerance)
- Cardiovascular disease (heart disease). People with PCOS have increased serum concentrations of CVD risk markers compared with controls, Abnormal lipid profile, raised triglycerides, raised total and low-density lipoproteins. Whether this apparent risk is translated into increased incidence of CVD in later life remains to be elucidated from further studies.
- Possible Atherosclerosis
- Hypertension (high blood pressure)
- Endometrial hyperplasia/cancer (womb cancer in women with prolonged amenorrhoea (no periods). Women of all ages with PCOS are at an increased risk of endometrial cancer but the risk of ovarian and breast cancer was not significantly increased overall from available studies.

Long-term risks are yet undetermined in non-obese people with PCOS.

Will I require regular follow up once I have a diagnosis of PCOS?

Long-term follow up of those living with PCOS is ideally recommended. However, there are no strict guidelines as to how often and who should be doing this. This can be discussed in more detail at the consultation and individual recommendations can be made.

PCOS Summary:

- Weight loss and lifestyle management is the mainstay and a focus on lowering insulin resistance will see an improvement of most symptoms. A fibre rich whole food anti-inflammatory plant-based diet helps in healthy and sustainable long-term weight loss. Given the commonality of PCOS with Type 2 diabetes and the metabolic syndrome, advising a WFPB diet is sensible advice with clinical and metabolic symptoms seeing improvement, often dramatic in many cases.
- Weight loss can be achieved by several methods resulting in improvement of metabolic markers. Most women tend to put weight back on within a few years, a sustainable diet that does not resort to calorie restriction would be helpful in managing PCOS long term. This is especially important because of the more serious longer term metabolic consequences of PCOS (Type 2 Diabetes, endometrial cancer, CHD)
- Given that there is agreement that insulin resistance is the main driver behind PCOS and in the absence of clear cut evidence and guidance for a particular diet strategy for the successful management of PCOS, it would be prudent and sensible to advise women similar dietary strategies that we know work for heart disease, metabolic syndrome and Type 2 diabetes
- Women should be encouraged to eat a fibre rich whole food plant-based way of eating, which is both low glycaemic and nutrient dense. Whole plant foods are anti-inflammatory and don’t raise blood sugars or increase insulin resistance. Advise women to crowd foods of low nutrient value off the plate by adding phytonutrient rich, fibre-rich plant foods
- Other lifestyle changes include stress management, ensuring good sleep quality, exercise, supplements of Vitamin D, Chromium and omega-3 to be considered
- Avoidance of smoking and alcohol should also be addressed
- The gut microbiome may play an important role in the management of PCOS
- Support recommendations for a low AGEs dietary content in people with PCOS by advising a whole plant-based diet.
- Encourage women to reduce high AGE foods to combat insulin resistance, inflammation and oxidative stress.
- A thorough nutritional assessment is useful to facilitate people with PCOS maintain

lifestyle changes
- Additional measures may be necessary to treat fertility, hirsutism or irregular periods, acne

Further information:

Verity is a UK charity for women whose lives are affected by PCOS

http://www.verity-pcos.org.uk/

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