

## Management of Polycystic Ovary Syndrome in Women by Implementing a Healthy Lifestyle and Effective Diet: A Review

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### ABSTRACT

Polycystic ovary syndrome (PCOS) is an endocrine disorder characterized by conditions such as anovulation, androgen excess, infertility, insulin resistance, depression and amenorrhea. Women with genetic predisposition are at a higher risk of being affected by it. Other environmental factors like sedentary lifestyle, unhealthy eating habits, lack of exercise, obesity has often been seen to trigger the onset of this condition. Due to the increased unhealthy lifestyle more number of women is being diagnosed with PCOS each year. There are also other health risks due to PCOS like impaired glucose tolerance, type 2 diabetes, dyslipidaemia, abdominal obesity, hypertension and cardiovascular diseases. Although, there is no permanent cure for PCOS but it can be treated with pharmacotherapy along with implementation of healthy lifestyle and proper diet. If PCOS is diagnosed early and managed properly then the associated reproductive, metabolic, and cardiovascular abnormalities can be effectively managed or prevented [1].

In this review article some research work has been discussed where implementing a healthy lifestyle and diet has shown to deal with PCOS problems. The effect of consumption of myoinositol, low glycemic index diet and omega 3 fatty acids on PCOS has been emphasised. PCOS is becoming an increasing cause of concern as mostly women in the reproductive age group is affected by it. Many teenage girls in their puberty also gets PCOS. PCOS is known to bring about anxiety and depression in patients. With the other conditions associated with it like excess facial hair growth, overweight, infertility: the anxiety and depression might get enhanced. PCOS may affect the quality of life of individuals if it is not dealt with early on.

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**Received:** October 17, 2020; **Accepted:** October 13, 2020; **Published:** October 18, 2020

### Introduction

PCOS is an endocrine disorder characterized by ovulatory dysfunction, androgen excess, infertility, insulin resistance, oligo or amenorrhea [2]. It is a complex disorder involving the improper function of one or more glands namely hypothalamus, pituitary gland, ovaries, adrenal gland and peripheral adipose tissue [3]. It is now a common condition present in 12-21% of women of reproductive age and up to 70% of cases remain undiagnosed [4]. According to the Rotterdam consensus 2003 which is widely accepted all over the world, the diagnostic criteria for PCOS is when 2 out of these 3 conditions are met by the patients: oligo/anovulation, hyperandrogenism and polycystic ovaries on ultrasound [2]. Women with genetic predisposition are more likely to be detected with PCOS and also certain environmental factors like obesity, sedentary lifestyle and unhealthy food triggers the onset of the process [4,5]. 50% of patients with PCOS are also obese or overweight [6]. Insulin resistance has been observed in many women with PCOS, independent of obesity [7]. Insulin resistance and hyperinsulinemia is seen in 40-50% of women affected with PCOS and 80% of PCOS women who are obese. In PCOS women there is an excess release of Luteinizing Hormone (LH) by the pituitary gland. There is also an increased risk of occurrence of impaired glucose tolerance, type 2 diabetes, dyslipidaemia, abdominal obesity, hypertension and cardiovascular diseases due to PCOS [8]. Some of the common therapeutic tools which have been in use to manage PCOS are oral contraceptives, anti-androgens. More recent form of pharmacotherapy is Insulin

sensitizers, Metformin, thiazolidinediones. Some emerging forms of therapeutic tools are statins, acupuncture [5].

Obesity and glucose intolerance are common in PCOS but they are not compulsory. Although PCOS is treatable but there is no permanent cure for this. Lifestyle changes with proper exercise and diet can help in managing this disorder. As obesity and insulin resistance is related to PCOS, weight management is the first line management of PCOS. However, the optimal diet composition is not yet known [9].

### Effect of Healthy lifestyle

The complications due to PCOS can also be managed by modifying the lifestyle habits and adhering to an appropriate dietary pattern. Many studies are being conducted to study the effect of different food groups on managing PCOS. A study conducted by Huber-Buchholz et al. has shown that reduction in central fat and improved insulin sensitivity by lifestyle modification leads to normal ovulation in amenorrhic PCOS women even though there is no significant weight loss associated [10]. Reduction of central fat distribution is more effective in gaining fertility than total weight loss. Abdominal fat is associated with insulin resistance, hyperandrogenism and PCOS. A reduction in the abdominal fat can facilitate in achieving regular ovulation and managing problems related to PCOS [11]. Another study showed that lifestyle modifications alone without the use of metformin help in improving ovulation in PCOS women [12]. A healthy

lifestyle, proper diet and exercising reduces central/abdominal fat, reduces androgenises, facilitates hair growth, regulates the menstrual cycle and improves insulin sensitivity [13]. The ovarian volume and microfollicles per ovary decrease even with a small reduction of around 5-10% of body weight. The mechanism of how the body weight reduction decrease the ovarian volume has not been established yet. It has been presumed that the decrease in the volume may be due to the reduction in microfollicles and ovarian stroma. Increased ovarian stroma is related to overproduction of androstenedione. Thus reduction in ovarian volume and number of microfollicles will result in the decrease in androstenedione and eventually decrease the facial hair growth [14].

### Effect of Low Glycemic Index diet

Glycemic index (GI) is the property of carbohydrate containing food that describes the rise of blood glucose levels in the body after its consumption. High GI foods like potatoes, white bread, short grain rice etc. are those which are rapidly digested, absorbed or transformed into glucose. They bring about an abrupt rise in the glucose levels. With the consumption of high GI foods the insulin concentration rapidly increases. After the intake of glucose from the food to the cells there is a rapid reduction in glucose levels which makes people feel hungry and they tend to over consume. On the other hand low GI foods such as soy products, beans, fruit, milk, pasta, grainy bread, lentils etc. slow down the digestion and absorption rate after consumption. The nutrient receptors in the gastrointestinal tract are stimulated for a longer time, which leads to a longer feedback to the satiety centre in brain [15]. Low GI foods benefit in weight management as they bring about satiety and promote fat oxidation instead of carbohydrate oxidation [16]. A research compared two diets of equivalent macronutrient and fibers but with different type of carbohydrate groups-one with low GI and the other moderate to high GI. Improved menstrual cyclicality was seen in more women (95%) who consumed low GI diet then in women (63%) who consumed healthy but conventional diet [17]. In another study done on 12 obese teenage boys it was seen that the voluntary intake of energy after the consumption of low GI meal was 81% lesser than that after a high GI meal, showing a considerable satiety in low GI food consumption. Also higher serum insulin levels, lower plasma glucagon levels, lower post absorptive plasma glucose, lower serum fatty acids levels, and elevation in plasma epinephrine was observed in high GI meal than in low GI meal.

### Effect of Omega-3 fatty acids

Omega-3 fatty acids have been found to improve some pathological conditions of PCOS. They have several beneficial properties including anti-inflammatory, antithrombotic, antiarrhythmic and antiatherogenic effects. The omega-3 fatty acids also may be effective in decreasing hirsutism, body mass index (BMI), LH, testosterone, insulin and increasing sex hormone-binding globulin (SHBG) and subsequently regulating the menstrual cycles in women with PCOS. They are also useful to improve the lipid profile. Fish oil is the main source of dietary omega-3 fatty acids and Chia, flax, and perilla seeds are major vegetal sources of essential omega-3 fatty acids. They also help against cardiovascular diseases, cancer, neurological, and hormonal disorders and also for their antioxidant activities. Vegetarians can also go for omega-3 supplements [18].

### Effect of Inositols

Inositol is a six carbon member ring compound with a hydroxyl group attached to each carbon. There are 9 possible forms of stereoisomers of inositol [19]. Out of which particularly two is associated with PCOS and its therapy: Myo-inositol (MI)

and D-chiro-inositol (DCI). MI to DCI ratio varies in different tissues. Glycogen storing tissues such as liver, muscle fat is seen to have more DCI levels than in tissues involved in high glucose consumption like brain, heart. In type 2 diabetes patients with insulin resistivity, epimerase activity is reduced and hence also DCI levels in these tissues decreases. In the ovary MI helps in glucose uptake and follicle stimulating hormone (FSH) signaling and DCI is involved in insulin mediated androgen synthesis [19]. Ovary is not insulin resistant and epimerase enzyme which is insulin dependent converts MI to DCI. In PCOS it is thought that due to an increased epimerase activity there is an increase of DCI and depletion of MI. This imbalance in the ratio may cause hirsutism due to the increase in androgen levels, impairment in FSH signaling can affect the oocyte quality as oocyte quality depends on glucose intake [19]. In fact the ratio of MI to DCI in the oocyte has been seen to decrease to 0.2:1 in PCOS women from 100:1 in normal patients [3]. When inositols are used as a pharmacotherapy agent for treating PCOS a combination of MI and DCI at a physiological ratio of 40 : 1 is used. This combination was seen to restore the hormonal imbalances more quickly than MI alone. This is beneficial for overweight PCOS women as MI works by improving the ovulatory function and DCI works by reducing the peripheral hyperinsulinemia [20]. MI as an insulin sensitizer has been seen to be an effective option in PCOS women as it helps in restoring the metabolic profiles and ovulation induction in infertile patients. Studies have proved it to be a safe molecule for consumption [21]. MI is the predominant isomeric form of inositol that is found in food. It is found in its free form as phosphoinositides or as phytic acid. High MI content is seen in fresh fruits, vegetables like peas, beans, oats and bran. High phytic acid is found in nuts like almonds, walnut, Brazil nuts. Citrus fruits except lemon also contain high amount of MI. Whole grain products are the main form of dietary phytate. However, the bioavailability of MI decreases as it is destroyed to a large extent due to heat treatment during the processing stages [3].

### Conclusion

Implementing healthy lifestyle habits along with proper exercise and diet can be effective in managing PCOS problems. Although an optimum diet has not been designed for women with PCOS, research has shown low GI diet to be more effective than a diet with high GI with the same fiber and nutritious value. Future studies are needed to prove this. Including food with high concentration of MI and omega-3 fatty acids can also help in dealing with PCOS complications. Weight loss leads to decreased androgen production, increased sex hormone-binding globulin (SHBG) and improved insulin sensitivity, thus resulting in improved menstrual cyclicality and enhanced fertility rates in PCOS women. Work is needed to design an optimal diet for women with PCOS as it has become a major cause of concern for women all over the world.

### References

1. Marques AR (2016) Polycystic Ovary Syndrome. Diabetes Case Rep 1:e103.
2. Garg D, Tal R (2016) Inositol Treatment and ART Outcomes in Women with PCOS. International Journal of Endocrinology.
3. Porcaro G, Bizzarri M, Monastra G, Filati P, Unfer V (2016) Strategies for the treatment of polycystic ovary syndrome (PCOS) women: the role of myo-inositol (MI) and d-chiro-inositol (DCI) between diet and therapy. Polycystic ovary syndrome (PCOS): clinical aspects, potential complications and dietary management. Hauppauge, NY: Nova science publishers.
4. Boyle J, Teede HJ (2012) Polycystic ovary syndrome. Reproductive health 41: 752-756.

5. Jain D (2016) Polycystic Ovary Syndrome - A Challenge of the Modern Times. *Matern Pediatr Nutr* 2:116.
6. Bargiota A, Diamanti-Kandarakis E (2012) The effects of old, new and emerging medicines on metabolic aberrations in PCOS. *Therapeutic advances in endocrinology and metabolism* 3: 27-47.
7. Mayer SB, Evans WS, Nestler JE (2015) Polycystic ovary syndrome and insulin: our understanding in the past, present and future. *Women's Health* 11: 137-149.
8. Salley KE, Wickham EP, Cheang KI, Essah PA, Karjane NW, et al. (2007) Position statement: glucose intolerance in polycystic ovary syndrome—a position statement of the Androgen Excess Society. *The Journal of Clinical Endocrinology & Metabolism* 92: 4546-4556.
9. Moran LJ, Ko H, Misso M, Marsh K, Noakes M (2013) Dietary composition in the treatment of polycystic ovary syndrome: a systematic review to inform evidence-based guidelines. *Journal of the Academy of Nutrition and Dietetics* 113: 520-545.
10. Huber-Buchholz MM, Carey DG, Norman RJ (1999) Restoration of Reproductive Potential by Lifestyle Modification in Obese Polycystic Ovary Syndrome: Role of Insulin Sensitivity and Luteinizing Hormone 1. *The Journal of Clinical Endocrinology & Metabolism* 84: 1470-1474.
11. Moran LJ, Noakes M, Clifton PM, Tomlinson L, Norman RJ (2003) Dietary composition in restoring reproductive and metabolic physiology in overweight women with polycystic ovary syndrome. *The Journal of Clinical Endocrinology & Metabolism* 88: 812-819.
12. Tang T, Glanville J, Hayden CJ, White D, Barth JH (2006) Combined lifestyle modification and metformin in obese patients with polycystic ovary syndrome. A randomized, placebo-controlled, double-blind multicentre study. *Human reproduction* 21: 80-89.
13. Moran LJ, Hutchison SK, Norman RJ, Teede HJ (2011) Lifestyle changes in women with polycystic ovary syndrome. *The Cochrane Library*.
14. Crosignani PG, Colombo M, Vegetti W, Somigliana E, Gessati A (2003) Overweight and obese anovulatory patients with polycystic ovaries: parallel improvements in anthropometric indices, ovarian physiology and fertility rate induced by diet. *Human Reproduction* 18: 1928-1932.
15. Ludwig DS, Majzoub JA, Al-Zahrani A, Dallal GE, Blanco I (1999) High glycemic index foods, overeating, and obesity. *Pediatrics* 103: e26.
16. Brand-Miller JC, Holt SH, Pawlak DB, McMillan J (2002) Glycemic index and obesity. *The American journal of clinical nutrition* 76: 281S-285S.
17. Marsh KA, Steinbeck KS, Atkinson FS, Petocz P, Brand-Miller JC (2010) Effect of a low glycemic index compared with a conventional healthy diet on polycystic ovary syndrome. *The American journal of clinical nutrition* 92: 83-92.
18. Sargi SC, Silva BC, Santos HM, Montanher PF, Boeing JS, et al. (2013) Antioxidant capacity and chemical composition in seeds rich in omega-3: chia, flax, and perilla. *Food Science and Technology (Campinas)* 33: 541-548.
19. Nestler JE, Unfer V (2015) Reflections on inositol (s) for PCOS therapy: steps toward success: 501-505.
20. Unfer V, Nestler JE, Kamenov ZA, Prapas N, Facchinetti F (2016) Effects of Inositol (s) in Women with PCOS: A Systematic Review of Randomized Controlled Trials. *International Journal of Endocrinology* 23.
21. Regidor PA, Schindler AE (2016) Myoinositol as a Safe and Alternative Approach in the Treatment of Infertile PCOS Women: A German Observational Study. *International Journal of Endocrinology*.

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