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Polycystic ovary syndrome and Hirsutism: A review

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An endocrine disorder known as Polycystic Ovary syndrome is troubling women of reproductive age. It is an autoimmune, polygenic disorder, which leads to many other health problems including infertility, insulin resistance, cardiovascular diseases and obesity. Hirsutism, a syndrome that occurs most probably in androgen dependent areas of the body and produces rough temporal hairs, which is due to high levels of androgen in the bloodstream. Women having PCOS are mostly affected by hirsutism. In hirsutism there is excessive hair growth on the face, abdominal region, chest, arms and foot that give a female male like appearance. Due to excessive androgen production 70 to 80% of females show hirsutism. The main root of hirsutism is excessive androgen production, which is related to polycystic syndrome. Dietary and life-style modification should also be prioritized for treatment, as it can help to improve many of the signs and symptoms of polycystic ovary syndrome.

Keywords: Polycystic ovary syndrome, Hirsutism, Androgen

INTRODUCTION

Some diseases can commonly occur in females of reproductive age, one of these include polycystic ovary syndrome. Polycystic ovary syndrome occurs due to an imbalance of hormones which results in the production of cyst in the ovarian follicles. Polycystic ovary syndrome occurs when there are a number of cysts present in the ovary. The size of the ovary increases up to 10 cm wide. The most common symptoms of PCOS are anovulation and oligo ovulation. Due to cysts, there is increased production of androgen i.e., hyperandrogenism which leads to male-like appearance in females. Apparent signs of excessive androgen include hirsutism, weight gain, hair-loss, acne, oily skin and enlargement of clitoris (Desai et al. 2015). Hirsutism is excessive hair growth on the body which is mainly due to hyperandrogenism and is also associated with oily skin and acne. Some women who are suffering from hirsutism have normal androgen levels as 5-

10% of the women have idiopathic hirsutism. Hirsutism's negative impact on psychosocial development is extremely distressing for females (Azziz, 2003). Hirsutism is not only decreasing aesthetics but also related to many disorders and diseases (Azziz, 2003). Dietary and lifestyle modification helps to improve the sign and symptoms of polycystic ovary syndrome. Most diets contain Zinc, livestock source organs & meat of mammal, seafood, egg & milk product seems to be the purest form of good absorption of Zinc. Plant based food products, which including grains, lentils, dry fruits or legumes, exhibit lower and far less adequately absorbable quantities to these items. Zinc performs the crucial part in reproduction, while this further serves like a co-factor in folic acid enzyme taking part throughout the regeneration in homocysteine to methionine (Nasiadek, 2020). The mixture of probiotic bacteria may improve or help to manage hirsutism. Skin care products or mechanical

techniques appear quite successful as well as long-lasting, used when combination either with neither androgen-inhibition nor peripheral-androgen stoppage (Douglas et al. 2006).

Pathophysiology

The overgrowth of hair cells is due to hormonal abnormalities. The hair which covers a person's body is soft pigmented hair before adolescence. These hair become harder and thicker because of the steroid hormone known as androgen DHT Dihydrotestosterone. Also when this hormone androgen exceeds its limit especially in males and females in puberty age the overgrowth of hair follicles starts. The change of normal hair into harder coarser hair is only determined by the position and time period of exposure to the steroid hormone and by the activity of 5 alpha reductase (Ceruti et al. 2018).

Although there are many parts which do not depend on androgen and its activity for example like eyebrows, lashes, scalp. The hair growth cycle has two phases 1). Anagen phase known as active hair growth 2). Telogen phase also known as resting or relieved phase in resting phase no further hair growth occurs because at follicle base the shaft of hair is separated at the region which is known as Dermal papillae and the growth is

restarted and the previous hair is taken out by the reactivity of papillae. Months or years can take place in this cycle to be completed due to which the growth of hair doesn't increase (Paus and Cotsarelis, 1999).

DHT is the hormone which acts on the hair shaft to promote rough hard terminal hair. This hormone is made by testosterone and is found in the bloodstream. 5- alpha reductase activity determines the production of DHT .Only due to the changes in this enzyme activity hirsutism differs from women to women even if they are having the same plasma levels (Taheri et al. 2016).

Pathological process of PCOS

Polycystic Ovary Syndrome is known by the endocrine, metabolic and genetic disorders (Allahbadia, 2011). The main symptoms of Polycystic Ovary Syndrome are Hirsutism, hairlessness, skin disorders, infertility (Rosenfield and Ehrmann, 2016).

The differences in the endocrine hormones lead to occurrence of Polycystic Ovary Syndrome like hyperandrogenism and high levels of estrogen and prolactin hormone and reduced levels of female sex hormone progesterone (Kirilovas et al. 2006).

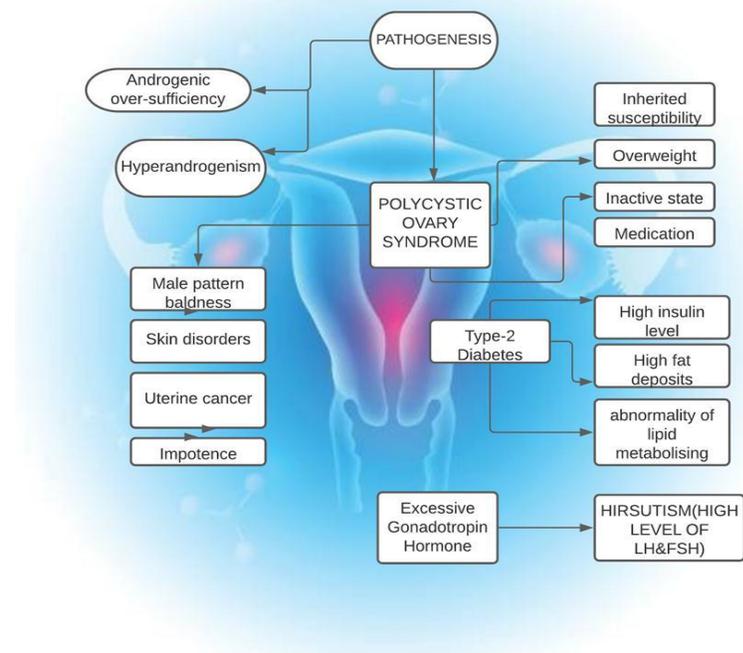


Figure: 1

Polycystic Ovary Syndrome is also common when an individual is having metabolic disorders like insulin resistance, type 2 diabetes, dyslipidemia (Kirilovas et al. 2006). It is seen in a study that women who suffer from polycystic ovary syndrome are more prone to have male steroid hormone androgen excess and high levels of testosterone as compared to healthy women. The two hormones that are involved are luteinizing hormone or follicle stimulating hormone which occurs due to the ovarian theca cells (Toscani et al. 2011). This flowchart (Figure 1) shows the major components in the pathogenesis of polycystic ovarian syndrome. It describes that the excess of androgen hormone is the main cause of PCOS and hirsutism related diseases (Rosenfield and Ehrmann, 2016).

Epidemiology

Ninety percent of women who suffer from hirsutism have PCOS. The medical condition that results from the overgrowth of hairs is known as hirsutism. Women all around the world suffer from this issue. The most estimated percentage that is known is about ten percent women of all racial groups are affected. The most common target of this problem is East Asian women, which are mostly affected due to having diseases like PCOS. Hirsutism can give future threats especially to women who are affected by it (Anjum et al. 2016).

Asian women have the highest ratio of this problem. It goes from 36.1 percent to 38.4 percent in Pakistan (Anjum et al. 2016).

A case control study was conducted in Pakistan with the objective of estimating prevalence of depression among patients of PCOS. A sample size of 225 women was taken. Results showed that 42% of PCOS women had anxiety, 31% had depression and 20% had both. In contrast, 11% of control women had anxiety, 9% had anxiety and only 3.5% had both depression and anxiety. The study concluded that polycystic ovary syndrome seems to be related with obesity, infertility, hirsutism, menstrual irregularities and insulin resistance (Zehra et al. 2015).

Association of PCOS with hirsutism:

Polycystic ovary syndrome (PCOS) is a female endocrine disorder, troubling women of reproductive age. In PCOS a person has high androgen, high estrogen and low progesterone level (Patel, 2018). Many factors can cause Polycystic ovary syndrome it includes genetics,

lifestyle blunder, chemicals, thyroid malfunction, high cortisol levels, hyperprolactinemia, CAH (congenital adrenal hyperplasia or adrenal tumors) (Boberg et al. 2010) (Yang et al. 2015) (Ozen et al. 2011). Females facing PCOS problems have common symptoms that include oligo ovulation or anovulation. Androgen production from the cyst is responsible for the male-like characteristics in females (Patel and Seema, 2018).

Around 70% of the PCOS cases have problems of hirsutism i.e. male like thick hair growth on the entire body in females (Vidyashri et al. 2019). High LH and insulin levels elevated androgen production. Raised insulin level in blood and low sex steroid binding globulin increases testosterone levels that damages the ovarian follicle maturation (Teede et al. 2010). Activity of follicles is greatly affected by androgen hormone, it increases the hair growth, thickness and hair's malenization (Wojcik et al. 2020). It is not necessarily true that females facing hirsutism have PCOS problems but on the other hand if females are having menstrual problems they observe hirsutism on their body due to increased blood androgen levels (Vidyashri et al. 2019).

Dietary Modifications:

Proteins:

Foods having more protein were worn in effective fitness plans from few months and have so far been for the benefit in the care of sufferers with Polycystic ovary syndrome. The elevated protein, reduced carbohydrates nutritional therapies were contrasted with such a standard feed intake in the report from Stamets et al. but they did not observe any change in plasma androgen levels (Kumar et al. 2005).

While doing different investigation the influence of creature nutritional therapy ingredients on losing fat, it has been said albumin consumption enhanced insulin levels lower than glucose or therefore ghrelin levels were reduced substantially more than insulin by albumin intake (Kasim-Karakas et al. 2007).

The below results show that although an elevated albumin, keto regime is not mandatory, albumin plays significant act in regulating increased insulin levels or feeding or must be comprised in a healthy range of nutrients containing complex carbohydrates, albumins or crucial triglycerides. It is proposed that refined albumin powders can cause the elevated prevalence of polycystic ovary syndrome in

prepared meals. The research exploring impact of meal preparation for albumin sequences in crops has shown that new techniques for meal preparation have changed the albumin composition of such crops, leading to improved conversion accompanied by excessive insulin discharge (Meade et al. 2005).

Carbohydrates:

Starches were found having influence mainly on polycystic ovary syndrome by their impact on blood sugar strength. Recent research showed increased fiber and decreased glycemic levels was effective in losing fat or insulin resistance (Stein and K, 2006).

Another recent study used intake of decreased glucose meal for one eighty two days to check its effect on fat or fleshy individuals with Polycystic ovary syndrome. It showed decline by twelve percent in weight or fifty four percent reduction on starving insulin levels. Effect of declined sugar content meals on gent hormones declined occurrence of pimples in gents. In European gent who had eaten a high-fat meal, blood androgens levels were also found to be declined and then started following a similar dietary pattern, increased-bulk, decreased-flabby meal after eight weeks (Wang et al. 2005).

Fatty Acids:

In comparison to Polycystic ovary syndrome, nutrient bulk is being examined. Marine grease showed that it had hormone sensifying impacts while using it as additive (Kasim-Karakas et al. 2004).

Vitamin E-associated marine grease showed that it reduces sensitivity to insulin, somatotropin or dehydroepiandrosterone sulfate in well males (Bhathena et al. 1991).

It was found in a research that female showed decline in excessive hair growth on body if they reduced five percent or more than that of figure mass from reduced grease, limited energy foods (Kiddy et al. 1992).

Effect of Broiler Commercial Chicken

Over the past decade the consumption of chicken has increased in Pakistan due to low cost, good taste and accessibility. As the numbers of chickens are decreasing, the industries have to increase the production of chickens in less time. (Ahmad and Saara, 2017).

A normal chicken takes 90 days to grow for consumption. Poultry industries are using supplements, additives (steroids, antibiotics,

arsenic, minerals) and hormonal additives(estrogen) to grow chicken in just 45 days(Gul et al. 2016). Bovine growth hormone is also injected to chicken to speed up their growth in less time. On consumption of chicken with BGH, the insulin level increases that causes hyperandrogenism which leads to PCOS. Broiler chicken is associated with hirsutism in females (Ahmad and Saara, 2017).

A study on rats was conducted in which rats were divided into five groups. One group that were fed with artificially grown chicken have high androgen and estrogen levels in their body as compared to other groups and that group of rats had inflamed and cystic ovaries(Ahmad et al. 2018).

Probiotics Benefits

It has been demonstrated that polycystic ovary syndrome is mainly due to chronic inflammation and insulin resistance. Due to disruption in bacterial flora the integrity of the mucosal wall losses that result in increase in lipopolysaccharide from gram negative bacteria in the systemic circulation. Follicular development is disrupted due to increased androgen production as a result of high insulin serum levels (Tremellen et al. 2012). Some of the species that act as probiotics are Lactobacillus, Streptococcus, Bifidobacterium, Lactococci and Saccharomyces(Azad et al. 2018). As described female are facing hirsutism due to the problem of PCOS, a hypothesis was presented in 2012 that states that PCOS progression is related to the microbial imbalance that head toward the other symptoms including hirsutism (Tremellen et al. 2012). Gut permeability is increased due to imbalance of gut flora, diet high in fats and sugar and it results in the entry of gram-negative into the circulatory system where it starts damaging the insulin receptors.

As a result, the insulin level increases and hyperandrogenism occurs (Lindheim L et al. 2017).

First study with 60 participants was conducted in 2018 to check the benefits of probiotics on female hormones with PCOS. Increase in SHBG and Decrease in testosterone was observed after 12 weeks of intervention (Karamali et al.2018).

Table 1 Benefits of Probiotics in relation to PCOS and Hirsutism

SAMPLE	PROBIOTIC TREATMENT	RESULTS
Rats (PCOS)	Lactobacillus	Decrease androgen levels, enhance oestrous cycle (Guo Y et al. 2016)
Women (PCOS)	L. acidophilus, L. reuteri, B. bifidum and Vitamin D	Improve Hirsutism, Decrease Testosterone level (Ostadmohammadi et al.2019)
Women (PCOS)	L. acidophilus, L. casei, L. rhamnosus, L. bulgaricus, L. breve, B. longum, S. thermophiles	Decrease insulin resistance (Shoaei et al. 2015)
Women (PCOS)	B. bifidum	Elevated insulin sensitivity, low Fasting blood glucose (Ahmadi et al. 2017)

Combination of Vitamin D and probiotics has shown more benefits in the intervention of Hirsutism as Vitamin D helps to improve the insulin resistance (Ostad Mohammadi et al. 2019). As hirsutism is linked with insulin resistance a study was conducted in 2015, women were given probiotic supplementation for 8 weeks. It was observed that after 8 weeks their fasting blood glucose and Insulin resistance decreased (Shoaei et al. 2015).

Association of zinc level

Zinc (Zn) supplementation may be recommended to enhance the therapeutic and biochemical properties of patients with PCOS. Zinc is a key component of several essential parts, such as hormone levels or fertilization, soreness or oxidative stress. Zinc deficient can serve with as well as the originator and the booster of lack of zinc. The fundamental pathways and metabolism properties the PCOS have which reducing antioxidative potential by inducing insulin sensitivity, triggering programmed cell death necrobiosis (Jamilian et al. 2016).

Zinc administration is projected for rising clinical and organic chemistry options of PCOS patients. Zn is concerned as a basic element for several very important functions as well as fertility and reproduction. Zn could be a key factor in several physiological state responses of the body, as well as aerophilic stress or a variety of physiological processes, particularly immunity effectiveness. Zn causes endocrine like estrogen, progestin and androgen levels stable throughout the complete emission cycle. Zn is reportedly important for polymer replication, polymer polymerases, super molecule synthesis and varied metabolism activities (Farhood and Iqbal, 2017). Zn mostly happens to regulate the development of follicles. However very little is understood concerning its effects on hirsutism. Zn

contains anti-androgen effects because it was shown to decrease the assembly of DHT by inhibiting Five-alpha enzyme action.

Zn nutritional pills showed great results as it decreases hair growth among the females suffering from polycystic ovary syndrome (Aliyev et al. 2020). Lack of Zn level might affect general problems in blood glucose level, create disturbance in lipid profile levels, arrest of the vesicle development common in polycystic ovary syndrome (Guler et al. 2014). Previous results have shown that supplements of Zn strongly enhanced the balance of insulin and glucagon to maintain blood glucose level and resistance of beta cells of pancreas. Thus, deficiency disease might make a case for hypoglycemic agent resistance in girls suffering from polycystic ovary syndrome (Sharif et al. 2017).

Lifestyle modification

Lifestyle change guidance should be encouraged in pcos (Adis,2014). Polycystic ovary syndrome medication should concentrate mostly on the stabilization short term symptoms of hyper androgen as well as an ovulatory sign or the reduction of metabolism problems. That can be possible through lifestyle interventions. Overall fat loss and belly fat loss can be primary essential care. Reproduction as well as metabolism advantages results from reduction of fat which further is supposed to decrease the circulation of insulin. A proper well-balanced diet with sensible intervention for the long term can be useful. Intervention in actions, decrease in depression. Quitting smoking and decreasing the drinking of alcohol. Some medication also plays a role in reduction in weight. Modification of lifestyle behavior for 3 to 6 months at the minimum (Norman et al. 2002). Metformin alone cannot help in the decrease in obesity among women with polycystic ovary syndrome. Though, whenever its combination of low-calorie diet along with some

workout it will make a way (AlHussain et al. 2020). Actions to prevent hirsutism in polycystic ovary syndrome involve inhibition of hyperandrogenism through oral contraceptive pills. If OCPs did not work and contraindication occurs, then metformin medication with lifestyle modification can also work (Patel and Seema, 2020).

Accelerated, short term calorie limitations that are low sustainable. A little indication of advantageous meal plan, self-sufficient with calorie restrictions, extreme brain health and Quality of life in polycystic ovary syndrome patients. Multi-dimensional RCT without a low-calorie regimen, we have already illustrated its advantage like low glycemic level-based diet, like sliced peas, veggies, pods and chickpeas, over all the medical nutritional lifestyle modification therapies and diet (Kazemi et al. 2020).

CONCLUSION

Abnormal hair growth in the body is a symbol that the patient might have polycystic ovary disorder and it is more common in females. It is because of excess of a hormone in the body known as androgen and to treat this, suppression of androgen is done. A child is born with soft hair on body but if it grows abnormally hard it is done by DHT hormone which is present in blood and made by testosterone, hirsutism is more prevalent in Asian countries. Carbohydrates with more fiber and low glucose is seen to reduce hirsutism and if fat intake is reduced it can lower the risk of development of polycystic disorder. Zinc is proved to be beneficial in reducing PCOS and increase fertility, fat loss and lifestyle modifications can also reduce hirsutism.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

EIS, SA and SAT conceived the idea of working on hirsutism whereas ES, FA and TS related the topic to PCOS. TS and SA proofread the document and made valuable contributions in its improvements. SA, EIS, TS, ES, FA, SAT all contributed to the manuscript. All authors read and approved the final version.

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