

The Role of Cinnamon Extract in Improving Insulin level for The Treatment of Polycystic Ovary Syndrome (PCOS)

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Abstract

The objectives of study were to investigate The Role of Cinnamon Extract in Improving Insulin level for The Treatment of Polycystic Ovary Syndrome (PCOS), the vitro and the vivo studies have shown reduction of insulin resistance by using cinnamon extract. The effects of cinnamon extract are represent in this study and the positive side of these effects on women with Polycystic Ovary Syndrome (PCOS). The conclusion of this study lead to that the oral administration of cinnamon has a good effect in improved insulin sensitivity in PCOS women. In addition, cinnamon has a good effect in increasing insulin sensitivity characterized by improvements in characteristics of the metabolic syndrome and decreases in risk factors associated with diabetes and CVD. Cinnamon extract has a good effect in improving antioxidant status and serum lipid profile so it used for reducing PCOS risk factors. According to this study, there is a need for a study with greater number of patients and a longer treatment duration to find the effect of cinnamon on PCOS.

Keywords: Cinnamon, Insulin Resistance, Polycystic Ovary Syndrome, Cinnamon Extract, Insulin.

Introduction

Polycystic ovary syndrome (PCOS) (watson, 2018) is a process in which a woman's hormone levels are not in normal case. Women with PCOS have higher levels of male hormones than the normal level due to Irregular body production of hormones. PCOS is defined by (smith, 2018) polycystic ovary syndrome is a process in which the endocrine system is not works normally due to the small Vesicles which fills in fluid produced on the ovaries and developed on it.

Many symptoms effect women with PCOS such as excess hair growth, changes to the menstrual cycle. In addition, PCOS women's can reach infertility if they does not treated (smith, 2018). The causes of PCOS not exactly known. In addition, this syndrome will make the woman skips their menstrual periods, and the hair growth in women bodies and faces will increased. In addition to the process to get pregnancy will be harder than normal, and PCOS can lead the women to a health problems such as heart disease and diabetes (watson, 2018).

The pathogenesis reasons behind PCOS are multifactorial and not known also it is far from be well know. So many factor will be debated such as Prenatal exposure to androgens, Adrenal androgen production, Hypothalamus/pituitary - ovarian axis dysfunction, environmental factors, genetics Insulin resistance and SHBG production.. (schmidt, 2011)

the Common symptoms of PCOS such as, a male-pattern baldness irregular periods, acne, darkening of the skin, Heavy bleeding, , weight gain, and headaches (watson, 2018).

The most important factor that cause's polycystic ovary syndrome (PCOS) is insulin resistance, this study will find the method in which reduces insulin resistance using cinnamon extract. Cinnamon extract has a role in reducing insulin resistance in vitro and in vivo studies due to enhancing insulin action by increasing phosphatidylinositol 3-kinase activity in the insulin-signaling pathway (Jeff G. Wang, 2007).

Problem and questions:

This study aims to discuss the role of cinnamon extract in improving insulin level for the treatment of polycystic ovary syndrome (PCOS) by answering the following questions:

1. What is polycystic ovary syndrome (PCOS) its causes and symptoms?
2. How polycystic ovary syndrome (PCOS) affect women life?
3. The polycystic ovary syndrome (PCOS) treatment in medicine?
4. What is cinnamon extract and what are the Therapeutic Benefits of the cinnamon extract?
5. How cinnamon extract used in polycystic ovary syndrome (PCOS) treatment, what is the role of cinnamon extract in the insulin-resistant parameter?

Polycystic ovary syndrome (PCOS)

Polycystic ovary syndrome (PCOS) is a health problem that effected women on the age lies between (15-44) and the percentage of women in that age which affected by PCOS are between (2.2-26.7) percent this problem is resulted due to irregular hormones production. (watson, 2018). Polycystic Ovary Syndrome (PCOS) is the most important cause of anovulatory infertility due to irregular hormone production, and the percentage of women that living with PCOS in their reproductive-aged is between 5-10 percent. (bernier, 2012).

Another definition of PCOS is a problem in the endocrine system in which make a disorder in hormone levels, the percentage of women that suffering from this syndrome are lies between (8-20) percent, and this syndrome can lead to other health problems such as high blood pressure, high cholesterol, type 2 diabetes heart disease and insulin resistance. (Smith, 2018).

Also (Lynch, 2013) defined Polycystic ovary syndrome as an irregular work in the endocrine system, PCOS effects the women's in the reproductive age. Polycystic Ovarian Syndrome is affected (4-12) percent of women around the word, and the related characteristics of PCOS are insulin resistance and hyperandrogenism.

The endocrine system is work through a complicated process due to its response to a specific stimuli by using chemical signaling and this signals can be hormones or chemical signals and according to these signals the processes in the body are controlled..

The polycystic ovary syndrome is a long-term health problem, which affected women during her lifespan. Stein and Leventhal first defined it as Stein-Leventhal syndrome in 1935, it is an endocrine disorder, which affect women's in their reproductive age, and its percentage can reached 6.5% of women (Williams, 2015).

Causes of Polycystic Ovarian Syndrome

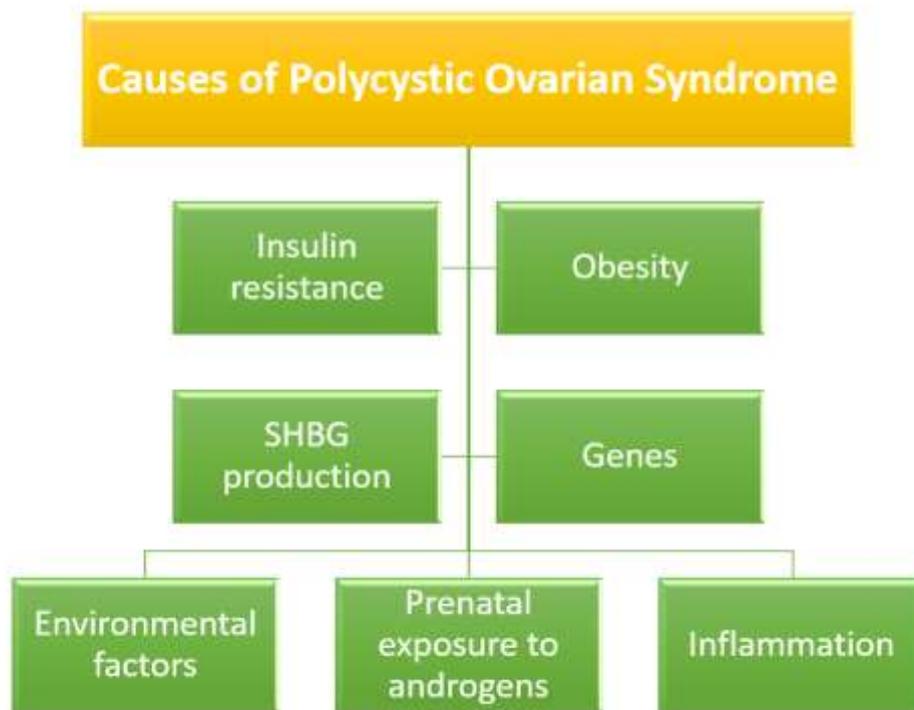


Figure (1): Causes of Polycystic Ovarian Syndrome (waston, 2018)& (schmidt, 2011)

The doctors believe that the reason behind that the ovary cannot making eggs and producing hormones in a normal way due to the high levels of male hormones, on the other hand, the causes of PCOS are not exactly known, but in this study the common reasons are listed below (watson, 2018):

- Genes: Studies show that genes are contribute in PCOS so PCOS runs in families.

- **Insulin resistance:** Insulin produced in the pancreas is a hormone that convert sugar from food to energy inside human bodies. in addition, more than seventy percent of PCOS women are suffering from insulin resistance, which is mean that the cells in the human body cannot use insulin in a proper way so the demand for insulin will increases then the pancreas will make more insulin. The rest of insulin that not used in the body will enhance the production of male hormones in ovaries.
- **Inflammation:** women with Polycystic Ovarian Syndrome have a higher level of inflammation compared with normal woman. The common causes of inflammation are overweight and higher androgen levels.

The Etiology and pathophysiology of PCOS from (schmidt, 2011) points of view are:

- **Genetics:** the effect of genes obviously noticed in family gatherings. Many studies show that the genes effect on PCOS, One of them show that PCOS in genetically identical twins shows increasing in concordance compared to non-identical twins.
- **Environmental factors:** the presence of special environment will develop the genetic factor effect on PCOS. The most common environmental factors that caused PCOS are weight gain and prenatal exposure to androgens.
- **Prenatal exposure to androgens:** PCOS can resulted by the excess exposure of fetus to high level of androgens produced from his mother so many studies show that the testosterone levels on umbilical vein in new born babies from PCOS mothers are higher than normal. **Obesity:** studies have implied that weight gain may promote the PCOS phenotype in a predisposed population so the Obesity has a considerable effect on the manifestation of PCOS and family.
- **SHBG production:** SHBG levels in PCOS women is less than a normal level, many reasons can effect SHBG producing in the liver such as obesity and inhibitory effects of insulin. if the SHBG decreased in a women bodies then the biologically active androgens will increased.
- **Insulin resistance:** Insulin resistance is the most important factor of PCOS principally among obese subjects. Insulin resistance will affected many processes in human bodies such as glycogen formation will be impaired, by the result the stimulation in the target tissues such as (liver, skeletal muscle, kidney, adipose tissue),

Insulin resistance can also causes gonadotropin aberrations, compensatory hyperinsulinemia and hyperandrogenism.

Symptoms of Polycystic Ovarian Syndrome

Symptoms of Polycystic Ovarian Syndrome can include insulin resistance, obesity, acne hair loss and infertility. PCOS Women that suffers from hyperandrogenism can have hirsutism that by result causes an excessive facial and/or body hair. In addition, women with PCOS may have a lack of ovulation so it will lead to anovulatory infertility. PCOS is the most common cause of anovulatory infertility in women (Williams, 2015).

Polycystic ovarian syndrome can have other symptoms such as excess androgen levels, insulin resistance, high blood pressure, irregular menses, oily skin, excess androgen levels, high cholesterol and triglycerides. In addition it can have excessive facial and body hair growth, sleep apnea, high stress levels, skin tags, infertility, acne, dandruff, dark patches of skin, fatigue, male pattern balding, type 2 diabetes, pelvic pain, depression and anxiety, weight management difficulties including weight gain or difficulty losing weight ,and decreased libido (smith, 2018).

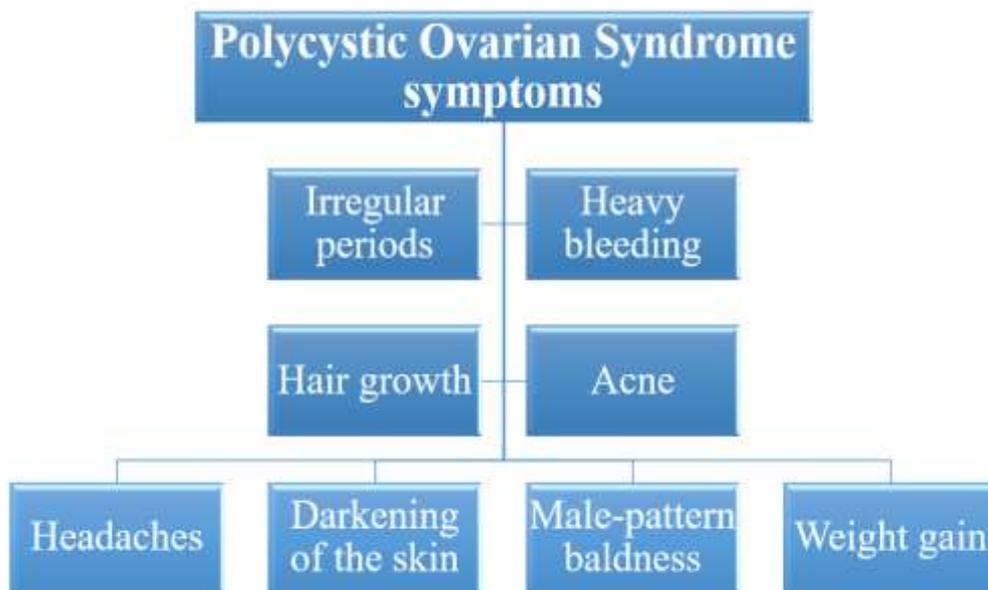


Figure (2): The most common PCOS symptoms (watson, 2018)

Symptoms of Polycystic Ovarian Syndrome in (Lynch, 2013) divided into three problems:

- First: Reproductive problems such as Infertility, Clinical signs of androgen excess, and various pregnancy complications.
- Second: Metabolic problems such as Insulin resistance, Diabetes Mellitus 2, metabolic syndrome, impaired glucose tolerance, and potentially cardiovascular disease.
- Third: Psychological problems such as reduction in the quality of life, Depression, Poor self-esteem, Anxiety, and possibly eating disorders.

The effect polycystic ovary syndrome (PCOS) in women body:

The higher-than-normal androgen levels in women can affect her health and, the effects of polycystic ovary syndrome listed below (watson, 2018):

- Infertility: the most important cause of infertility is PCOS, because PCOS prevent women from ovulate regularly so it cannot get pregnant easily or it cannot get pregnant at all.
- Metabolic syndrome: PCOS is connecting with gaining weight so the percentage PCOS women that suffering from obesity is reached to 80 percent, in addition both reasons of PCOS and overweight are increasing many health risks such as High blood pressure, High LDL (bad) cholesterol, High blood sugar, and Low HDL (good) cholesterol, which called The metabolic syndrome factors . Moreover, these factors can lead to a heart diseases, stroke, and diabetes.
- Endometrial cancer: the thickness of the uterine lining will increased because PCOS prevent the uterus disposal after ovulation in some months, so this accumulation can lead to endometrial cancer.
- Depression: he hormonal changes in PCOS women's can lead them to a depression and anxiety, and other symptom of PCOS such as excess hair growth can also affects their emotions.

Medical treatment of polycystic ovary syndrome (PCOS):

The most common medical treatments of PCOS are (Lynch, 2013):

- First: Metformin: it is an anti-diabetic drug, also it is insulin-sensitizing drug, and it works by suppressing the process of glucose production from liver. On the other hand, it can treat or decrease some symptoms of PCOS such as fatigue, hyperandrogenism and hyperinsulinemia, menstrual abnormalities, headaches, hirsutism, and weight gain.
- Second: Oral Contraceptives (OCP): Oral contraceptives can treat many problems such as endometrial buildup, Hyperandrogenism, menstrual irregularity, and Decrease SHBG and gonadotropin production. Moreover, the reduction on SHBG and gonadotropin can lead to decrease the percentage of bioavailable testosterone by (40-60) percent.

Other medical treatments shown by (watson, 2018) are Birth control, Metformin, Clomiphene, Hair removal medicines, Surgery.

Medical treatments from (smith, 2018) point of view are:

- Birth control pills: Birth control pills can help in regulation of hormones and menstruation.
- Diabetes medications: Diabetes medications can help in managing diabetes.
- Fertility medications: if a women want to get pregnant then the use of clomiphene (Clomid) should be included, on the other hand, clomiphene is a combined of metformin and clomiphene
- Fertility treatments: Fertility treatments can be include inseminations or in-vitro fertilization (IVF).
- Surgical options include:
 - Ovarian drilling: the production of androgens can suppressed by made tiny holes in the ovaries.
 - Oophorectomy: Surgery removes one or both ovaries.
 - Hysterectomy: This includes the removal of all or part of the uterus.
 - Cyst aspiration: Fluid from the cyst removed.

Cinnamon and Cinnamon extract

Cinnamon is tropical evergreen plant that obtains from the inner bark of trees from the genus *Cinnamomum*, several countries in the world use it as a spice (Ranasinghe, et al., 2013). There is extensive cultivation of *Cinnamomum zeylanicum* in the tropical regions of the world. In addition, *Cinnamomum zeylanicum* is type of the Lauraceae family that is native to Sri Lanka and India. (borzoei, et al., 2018). Cinnamon use not only on culinary but also can be used in medicinal. All parts of cinnamon tree can used such as flowers, leaves, roots, fruits and bark. The process of making cinnamon is by cutting the stems of the tree then the inner bark extracted and the woody part removed. (leech, 2018). The main types of cinnamon listed below:

- Ceylon cinnamon or true cinnamon.
- Cassia cinnamon: the type of cinnamon that commonly use which known as (cinnamon).

The most common Benefits of cinnamon are (leech, 2018):

1. Cinnamon is full of Powerful Medicinal Properties.
2. Cinnamon is full of Antioxidants.
3. Cinnamon Has Anti-Inflammatory Properties.
4. Cinnamon can decrease the Risk of Heart Disease.
5. Cinnamon increase the Sensitivity to Insulin.
6. Cinnamon has a Powerful Anti-Diabetic Effect by reducing Blood Sugar Levels.
7. Cinnamon can has a good Effect on Neurodegenerative Diseases.
8. Cinnamon can work in protection Against Cancer.
9. Cinnamon Helps Fight the Infections of Fungal and Bacterial.
10. Cinnamon can use in Fighting the HIV Virus.

The Role of Cinnamon Extract in Improving Insulin level for The Treatment of Polycystic Ovary Syndrome (PCOS):

Many studies show that Cinnamon extract have a good effect on insulin resistance. Moreover, also it used in PCOS women in the regulation of menstrual. (waston, 2018).

Many studies show the effect of cinnamon in the insulin. one study show that the consumption of 1.5 teaspoon has a good effect in lowering the insulin response, another study for 14 days show that taking cinnamon before drinking a high-sugar drink by young men have a good effect in lowering insulin levels (spritler, 2016).

cinnamon can increase the glucose transportation into cells and the effects of insulin can imitates, because of the powerful effect of cinnamon in increasing insulin sensitivity which lead lower the blood sugar. One study show that consumption of cinnamon by seven men has increase the insulin sensitivity during twelve hours after consumption. Moreover, another study on eight men show the same results in increasing insulin sensitivity after two weeks of cinnamon consumption. (pearson, 2017) .

study on Fifteen PCOS women was done for study the effect of cinnamon extract on insulin resistance parameters in polycystic ovary syndrome (Jeff G. Wang, 2007), the result of the study are:

1. Cinnamon extract has a powerful ability in reducing insulin resistance and fasting glucose too.
2. The mean HOMA-IR in the cinnamon group decreased significantly from a pretreatment value of 2.57 – 1.43, which was not statistically different from that of the normo-ovulatory controls presumably without insulin resistance.
3. The percent of mean glucose reduction is reached to (21%), also a significant increase in Matsuda's insulin sensitivity index was noticed.
4. The insulin sensitivity significantly improved, during eight week of cinnamon extract consumption by nondiabetic PCOS women.

Another study on thirty males and thirty females to discuss the effect of polyphenols from cinnamon (CP) in improving insulin sensitivity and the results are (Anderson, 2008):

1. CP have a good role in increasing the activity of tyrosine phosphorylation and reduction the activity of phosphatase that suppress the activation of insulin receptors, by result the insulin receptors will be activated.
2. The amount of GLUT4 protein and insulin receptor b increased by using CP.
3. The activity of glycogen accumulation and glycogen synthase increased; also, glycogen synthetase kinase-3 b activity decreased by using CP.
4. The tristetraprolin and the amount of the early-response anti-inflammatory protein increased by using CP.

Another study on PCOS women established about the Effects of cinnamon supplementation on antioxidant status and serum lipids, and this study was conducted on 84 overweight or obese PCOS patients; aged (20-38) years, and this study resulted by: (borzoei, et al., 2018):

1. The serum total antioxidant capacity was significantly increased by using cinnamon (P= 0.005).
2. A significant reduction in Malondialdehy compared with placebo (P=0.014).
3. The serum level of total cholesterol that Represented by the high-density lipoprotein cholesterol and the low-density lipoprotein cholesterol, improved significantly by using Cinnamon supplementation (all P < 0.05).

Conclusion and recommendation:

In conclusion, the oral administration of cinnamon has a good effect in improved insulin sensitivity PCOS women. In addition, cinnamon has a good effect in increasing insulin sensitivity characterized by improvements in characteristics of the metabolic syndrome and decreases in risk factors associated with diabetes and CVD. On the other hand, there are many benefits in consuming cinnamon and aqueous extracts of cinnamon on lipids, glucose, inflammatory response insulin, and antioxidant status. According to these effects, the risk factors of diabetes and CVD will decreased. Moreover, an improvement in the metabolic syndrome leading to decreased incidences of these diseases. Cinnamon extract has a good effect in improving antioxidant status and serum lipid profile so it used for reducing PCOS risk factors. According to this study, there is a need for a study with greater number of patients and a longer treatment duration to find the effect of cinnamon on PCOS.

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