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# A study on corrective effect of yogic asanas on severity of polycystic ovary syndrome in some selective women

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**Abstract**
Hormone status is affected by environment, as proved by many previous studies. Now it is significantly affecting the in vivo hormonal production, their chemistry and even their functioning. Between 1 in 10 women of childbearing age has PCOS. It can occur in girls as young as 11 years,. Polycystic Ovary Syndrome, or PCOS, is a metabolic disorder that affects the female reproductive system. The key characteristics in the studied group include irregular menstruation, obesity, infertility, acne and hair growth on the face, chest, and back (hirsutism) and ovarian cysts. Some have Type 2 diabetes. And most of them have effects of androgenic (masculinizing) hormones. Serum insulin levels are significantly higher in subjects having PCOS, androgens, specifically testosterone, and often less estrogen and progesterone than normal. Many other associated health problems are also seen –dyslipidemia, autoimmune thyroiditis, high blood pressure. But the most disastrous effect is stress via PCOS stimulates excessive production of Insulin, finally Insulin Resistance Diabetes [Type –II Diabetes] is developed. It has been found that a permanent cure is not achieveable by medicines only, as discontinuation of medical treatment results in reoccurrence of symptoms and complications, with absence / irregular menstruation cycle. For acne and excess hair growth, the diuretic spironolactone (Aldactazide) can help for a short duration with resultant hyponatremia (Low Na serum level) & hypovolaemia (Low serum K level) like complications. And for women who desire pregnancy, clomiphene (Clomid) can be used to induce ovulation, but excessive weight gain is additional problem with this. Studies have indicated that diabetic medications that are designed to improve the action of the hormone insulin may benefit women with PCOS. Long-term trials of these insulin-sensitizing drugs -- such as Avandia (rosiglitazone), Actos (pioglitazone), and Glucophage (metformin) for PCOS are underway and proved not significantly beneficial.
Alternative therapies are found beneficial as they are treating without any side effects and specially yogic practices for the remedy of PCOS like syndrome are found intense therapeutic even after discontinuation of yogic asanas for PCOS.

**Keywords:** PCOS, hormone, dyslipidemia, autoimmune thyroiditis

## Introduction
PCOS is a complex metabolic, endocrine and reproductive disorder affecting approximately 5-10% of the female population in developed countries. The prevalence of PCOS is on the rise in developing nations like India, which are undergoing rapid nutritional transitions due to westernized diets and lifestyle. However, less appreciated in the literature are the developmental psychosocial impacts for women diagnosed with PCOS, especially in developing countries. Alternative therapies are now getting popular for many community based diseases including polycystic ovary syndrome.
The study by Art of Living group in India: Founded in 1981 by Sri Sri Ravi Shankar, The Art of Living is an educational and humanitarian movement engaged in stress-management and service initiatives. Long and consistent yoga practice can help in the management of PCOS. (http://www.artofliving.org/in-en/yoga/yoga-for-women/yoga-for-PCOS the study suggested the following yogic asanas beneficial for PCOS-

1. Butterfly Pose can be very helpful in PCOS. Don't flap your legs too much; instead try holding the posture for long.
2. Even more helpful is Supta Badhakonasana (Reclining Butterfly Pose), which works just like the Butterfly Pose,this time lying down. This is what makes it extremely relaxing. To enhance the experience, play some soft music and place cushions under your hip. For beginners, it is a good idea to use cushion support while doing this posture.
3. Bharadvajasana (Bharadvaja's Twist) is a seated spinal twist that helps PCOS patients.
4. Chakki Chalanasana (moving the grinding wheel) is a very simple exercise with several benefits. It helps massage the liver, kidneys, pancreas, uterus and the reproductive organs.
5. Shavasana (Corpse Pose) is another useful posture to try. In PCOS, the more you relax, the better you feel and this posture will help you completely relax at the end of your yoga session.
6. Padma Sadhana practice is also considered very effective for PCOS patients.
7. Make sure you don't hold the postures that put pressure on the abdomen (Bow Pose, Superman Pose, Cobra Pose and Boat Pose) for a long time.
8. A few rounds of Sun Salutation at a faster pace can be good for weight loss; however, it is a good idea to practice only a few slow rounds daily for more relaxation.

9. A study on Effect of holistic yoga program on anxiety symptoms in adolescent girls with polycystic ovarian syndrome: A randomized control trial-done by Ram Nidhi, Venkatram Padmalatha, Raghuram Nagarathna, and Ram Amritanshu and

Ms. Nidhi Ram, #19, Eknath Bhavan, Gavipuram Circle, Kempegowda Nagar, Bangalore - 560 019, India. The study concludes that twelve weeks of a holistic yoga program in adolescents with PCOS is significantly better than physical exercise program in reducing anxiety symptoms. Thus, they recommend yoga to be incorporated as complimentary in management of adolescents with PCOS as this may help in reducing the progression of the disease.

In an another study on psycho physiological effect of vethathiri maharishi's kayakalpa yoga on PCOS – clinical trial by S. Shanthi Department of Yoga For Human Excellence, Bharathiyar University, Coimbatore, India. Dr. K. Perumal Phd, Director Department Of Wcsc-Vision For Wisdom (Academy) Aliyar. The Findings from these case reports indicate that PCOS patient got good result by practicing the kayakalpa yoga and this yoga practice should reduces body weight and also controls the blood glucose level, which in turn regulates the ovarian path way. Currently the standard of care treatment for women with PCOS ranges from life style modifications, associated with diet, weight loss, and exercise programs.

There is no side effect in practicing kayakalpa yoga. kayakalpa yoga not only does it help in healing PCOS and the whole body but it improves overall health. Through kayakalpa yoga the vital force is channeled up, stimulating all the functions of the nerve plexus as well as the endocrine glands that are responsible for Secreting hormone. There is a need to avoid stress and tension as kayakalpa yoga exercise is a method for spiritual expansion. Hence poly cystic ovary is a syndrome not a disease. It detected in early stages it could be cured. This study was aimed to observe physiological changes patient undergoing kayakalpa exercise. Hence kaya kalpa is the culmination of kundalini yoga, and its objective is to enable the practitioner to postpone the ageing process and death. Another study done by mrs shashikalavathi Goutham college of nursing manjunatha nagar, west of chord road mrajajinagar, bangalore-10., west of chord road rajajinagar, bangalore-10. A study conducted on increase risk of the depressive disorders in women with PCOS, is associated with several metabolic complications.

A few small studies have also suggested an increased risk of depression in women with PCOS. The goals of this study were to estimate the prevalence of depressive disorders in women with PCOS compared with controls and to evaluate the correlation between depression, hyper and rogenism, and other metabolic markers. Women with PCOS. Women without PCOS seen during the same time. Period for an annual exam were used as control subjects. Depressive disorders, Women with PCOS were at an increased risk for depressive disorders compared with controls. The report was a significantly increased risk of depressive disorders in women with PCOS and recommend routine screening in this population.

A study conducted on "Quality of life in adolescent girls with PCOS", A Cross-sectional study of female adolescents conducted at an urban hospital with 97 adolescents girls with PCOS and 186 healthy women. HRQL (health related quality life) scores as determine by the child health questionnaire-child self report form. It says Adolescents with PCOS experience lower HRQL compared with healthy adolescents.

A study published in Indian Express says one in five Indian women suffer from Polycystic Ovary Syndrome (PCOS), a condition characterized by hormonal imbalance, leading to difficulties in conceiving, according to a study. The study conducted by Metropolis Healthcare also stated that women in the age group of 15-30 years were at high risk. For the study, some 27,411 samples were tested over a period of 18 months. "The increasing trend of PCOS is predominantly seen in the age group 15 to 30 years. Out of 27,411 samples, around 4,824, (17.60 percent) of the females face hormonal associated risk with Polycystic Ovary Syndrome," said the report.

**The Magnitude of the problem**

- More than 50 percent of women with PCOS will have diabetes or pre-diabetes (impaired glucose tolerance) before the age of 40.
- The risk of heart attack is 4 to 7 times higher in women with PCOS than women of the same age without PCOS.
- Women with PCOS are at greater risk of having high blood pressure.
- Women with PCOS have high levels of LDL (bad) cholesterol and low levels of HDL (good) cholesterol.
- Women with PCOS can develop sleep apnea. This is when breathing stops for short periods of time during sleep.
- Women with PCOS may also develop anxiety and depression and vice versa. It is important to consult doctor about treatment for these mental health conditions.

Based on these findings we designed a study based effect of regular yogic practices on women with Chronic PCOS, specially on their biochemical profile related with PCOS, so that the effect can be proved clinically.

**Study size**- Intervention Group-30 (randomly selected on the basis on the basis of occurrence of PCOS, which is clinically conformed). They have given a set of nine asanas, which are proved to correct the condition of PCOS in some previous studies. As the subjects of this yogic asanas intervened group belonged to residents of Bilaspur City, thus they all were requested to join yogic centres to perform their yogic asanas under the supervision of yoga experts. Most of them joined Oxygen Yogic centre, Sindhi coloney, Bilaspur for the same. This group is asked tp continue their medical treatment apart from the yogic practices.But 9 of them were not using any medicine, they were using only yogic asanas as remedy of PCOS.

**Control Group**-30 (demographically matched with Intervention Group). They were continued with medicinal treatment as prescribed by clinicians. (anti-androgenic & insulin antagonistic). No yogic practices were recommended and intervened to this group.

**Time of study** -90 Days (July 2015-Oct-Nov 2015)

**Age range**-33-57 years.

**Economic status** –lower to moderate.

**The following estimations were made**

- Their physical examination was done for physical symptoms of PCOS. The visual symptoms of the hormonal imbalances as virilism, hirsutism, infertility, acne, oligomennorohea/ amneorrhoea, hypermenorrhea, central obesity were also considered for conclusion.
- Their body measurements were measured and BMI was calculated.
- Their biochemical profile was assessed for conforming the occurrence of PCOS
- Serum estrogenic level ( Estradiol) was assessed by using Estradiol Kit manufactured by Adaltis Italia (Italy) in Abhay's lab, Bilaspur.(05 samples were analysed by this method as the patients made the payment, other samples were analysed by Mini Vidas –model 500 in the same lab)
- Progesterone was estimated by using Hormonal Assay done in Mini vidas in Akash patho lab, Bilapsur.
- Serum Testosterone level was also assessed by the same procedure in all subjects and controls.
- Serum Glucose level was assessed by using HbA1c by using Nycocard.
- Serum C-Peptide level was assessed by using- serum C-peptide (ELISA)-kit made by HIPAA.
- SHBG level was assessed by Ranbaxy lab, only for eleven persons.
- The Androgen Index was calculated by the formula-
- FA1 = 100 X Total Testosterone /SHBG
- Total Lipid Profile was estimated by using Auto-analyser-
- Kits for analysis were used –

a. Cholesterol Estimation Kit (one step method of Wybenga and Plleggi) (Catalog No. – 25924)
b. HDL Estimation Kit (One step method of Wybenga and Plleggi) (Catalog No.– 25924)
c. Triglyceride Estimation Kit (Enzymatic colorimetric method GPO–PAP liquid stable single regent) (Catalog No. 77034 (6×250 ml)).

- HDL (High Density Lipoprotein) -The reagent used for it was 16% polyethylenglycol and the absorbance was read at 510nm against blank reagent and calculation was done by
  Ax/As × 50 × 2 = mg/dl HDL cholesterol
- Cholesterol: It was enzymatic calorimetrically measured at 510nm. The reaction was as-

$$\text{Cholesterol ester} \xrightarrow{\text{Cholesterol esterase}} \text{Cholesterol + fatty acid}$$

$$\text{Cholesterol} + O_2 \xrightarrow{\text{Cholesterol oxidase}} \text{cholest-4-en-3-one} + H_2O_2$$

$$H_2O_2 + \text{4-AAP} + \text{4 chlorophenol} \xrightarrow{\text{Peroxidase}} \text{Quincneimine} + H_2O$$

The calculation was done by – Ax/As × 200 = mg/dl cholesterol

Teiglyceride: The Serum triglyceride levels were also also measured by enzymatic calorimetric method at 510 nm and expressed as Ax/As × 200 = mg/dl triglycerides (x= sample, S= Standard)

$$\text{Triglyceride} \xrightarrow{\text{Lipase}} \text{glycerol + fatty acid}$$

$$\text{Glycerol} + \text{ATP} \xrightarrow{\text{Glycerol Kinase}} \text{glycerol 3 phosphate} + \text{ADP}$$

$$\text{Glycerol-3 phosphate} + O_2 \xrightarrow{\text{Glycerol phosphate}} \text{Dihydroxy acetone + Oxidase Phosphate} + H_2O_2$$

$$H_2O_2 + \text{4-AAP} + \text{4 chlorophenol} \xrightarrow{\text{Peroxidase}} \text{Quinoneimine (Red Coloured Dye)} + H_2O$$

The colour density of Quinoneimine is measured in colorimeter.

The LDL value was calculated by using – Fw formula.

- Pelvic Exam was done by expert gynecologist- to see if ovaries are enlarged or swollen by the increased number of small cysts. ( By Dr Gauri Deshkar)
- Vaginal Ultrasound (sonogram) of the subjects was done on our request, we just collected the data. To perform this test that uses sound waves to take pictures of the pelvic area. It is used to examine ovaries for cysts and to check the endometrial material (lining of the womb). This lining may become thicker if periods are not regular. ( Dr Balani Lab)
- The thyroid is also affected due to this condition, so we assessed T-3, T-4 and TSH levels of persons from each group. The estimation was done by Thyrocare lab, Bombay. Also visual symptoms of hypothyroidism as dry skin, constipation, fatigue, joint stiffness, swelling in face, hair loss were observed for conformation. (In Thyrocare Lab)
- Mostly these estimations were done by the subjects and we collected the results. Some estimations were done by us.

## Observations

### Biochemical Observation

**Table 1:** Mean, SD & 't' Values of parameters assessed-

| parameters | (mean ± Sd) | | Change in percent-age value |
|---|---|---|---|
| | Control Group | Yogic Asanas Intervention Group Experimental Group) | |
| Serum Estrogen | 92 pmol/L | 233 pmol/L) | 60.52 % down |
| Serum Progesterone | 0.73 ng/mL | 1.66 ng/mL. | 56.03 % down |
| Serum testosterone | 81 ng/dL | 53 ng/dL | 52.83 % up |
| Serum Cholesterol | 281 mg/dl, | 177 mg/dl, | 58.75 % up |
| HDL (mg/ml) | 32 mg/dl. | 41 mg/dl, | 21.96 % down |
| Serum Triglyceride | 314 mg/dl | 183 mg/dl | 71.58 % up |
| Cholesterol: HDL | 6.1 | 4.9. | 24.48 % up |
| LDL (mg/ml) | 129 mg/dl, | 78 mg/dl, | 65.38 % up |
| Waist/ hip ratio | 0.83 | 0.62 | 33.87 % up |
| BMI | 27.44 kg/m2 | 21.6 kg/m2 | 27.03 % up |
| Glucosylated Hb | 8.3 | 5.2 | 59.61 % up |
| c-peptide | 2. 3 ng/ mL | 1.1 ng /mL | 109.09 % up |
| Androgen Index | 10.31 | 4.23 | 143.73% up |

## Conclusion

1. The mean serum total estrogen level in the control group was observed [Follicular Phase-5 days] –92 pmol/L, it is 63% lower than the normal values. 92% ladies of the experimental group showed trend of improved serum estrogen levels. On the other hand 11% females who are matched in demographic data, showed marginally low serum estrogen levels. Their mean estrogen level was 233 pmol/L when estimated on the matched phase.
2. The mean serum progesterone of control group [in pre ovulation phase] was observed-0.73 ng/mL, it is 57 % lower than the yogic assanas intervened level. The 9 subjects of experimental group showed lower progesterone level, they have mean progesterone level 1.66 ng/mL.
3. The mean serum Testosterone level was quite higher in most of the controlsubjects-[74%] –the mean level was 81 ng/dL. The intervened group has mean serum Testosterone level 53 ng/dL.
4. The mean C-Peptide level of control group was observed significantly high. Approx 42% control subjects showed higher serum C-peptide levels. [mean 7.2 ng/ml ]. This value is approx 49 % higher than the experimental group levels. The yoga intervented group has mean 3.2 ng/ ml c-peptide level. So, 7 women of the control group have diagnosed type-II diabetes.
5. The level of Glucosylated Hb was-7.3 % [HbA1c of 6% or less is normal. HbA1c above 6.1 % is a newly recommended criterion for diagnosing diabetes.]. 42 % subjects of control group have significantly higher c-peptide level. The intervented group showed mean level of 2. 3 ng/ mL. (Normal Range-1.1-4.4 ng /mL) [n= 6 each group]
6. Mean body mass index (BMI) was 21.6 kg/m2 in yoga practicing women, 27.44 kg/m2 in control subjects(n=44) and 31.86 kg/m2 in obese subjects from the control group.(n=11).
7. Mean waist: hip ratio (WHR) was 0.62 in experimental women and 0.83 in control subjects. Seventy percent control subjects were overweight, among whom 46.93% had high testosterone levels, 44.2% been hirsute, having significantly high BMI and total testosterone (TT).
8. 62.8% of controls fulfilled sonographic criteria for diagnosing PCOS - 43.45% of them bilateral, 12.72% only left-sided and 6.81% only right sided. 59.3% were hirsute and 38.6% hyper insulinemic (BMI and TT were significantly high). Positive predictive value for TT was 64.44%. In experimental group only 33% have minute cysts in their both ovaries, only 4% of this group did not show any improvement in this aspect.
9. The 6 subjects from each group have been tested for status of thyroid functioning, mean T3 level of control group was 0.83 nmol/L, mean T4 level was- 3.34 ugm/ dL, and TSH level was 6.12 ulU/ml. This profile indicated marginal hypothyroidic status, but the results showed no significant difference with the experimental group. [Experimental group- T3- 1.03 nmol/L, T4-4.64 ugm/ dL, and TSH level was 5.32 ulU/ml.]
10. The stress and anxiety level is moderately correlated with obesity (r= 0.656), means the stress level drives the person to eat more.
11. Also a significant negative correlation is observed among stress and Estradiol level. (- 0.677)
12. Dislipidemia is prominent problem in androgenic hormonal profile, as expected the experimental group has prominent dislipidemia- with hypercholesterolemia, hyper-triglyceridemia, lower HDL serum levels.
    [mean Cholesterol- 281 mg/dl, Triglyceride-314 mg/dl and HDL – 32 mg/dl., LDL by Fw formula- 129 mg/dl, Cholesterol: HDL- 6.1., where as the values of lipid profile of experimental group was within normal range-. In control group cholesterol-177 mg/dl, triglyceride- 183 mg/dl and HDL-41 mg/dl, Cholesterol: HDL- 4.9. Thus a significant difference is observed among the groups –in respect of serum Cholesterol and triglyceride levels.]
13. The Androgen Index of control group was 10.31, this is drastically high than normal index of 5-6.
14. High to marginally high B.P. was observed in both the

groups,

15. The 82% control subjects have hirsutism and acne, 46% have hyper-menorrhoea, 23% have severe amenorrhoea, and 29% have oligo-menorrhea, 2% subjects are observed normal in this very aspect. 47% have central obesity.

**Conclusion**

The visual and biochemical examination of the experimental group showed strong univariate co-relation with the regular practices of set of 9 assanas and correction in the severity of PCO with significantly corrected hormonal profile in this particular respect. The development of type –II Diabetes is additional health problem significantly related with PCOS., The results are in coordination with some previous studies, but it is premature to conclude that the regular practices of yogic assanas has significantly corrective effect on PCOS. A more wide and intense community based study is required to conform the correlation. We studied the effect of regular yogic aasnas and other yogic practices on the status of PCOS. We do not know exactly how yoga works for good health. But it reduces stress like other mind-body therapies, and we believe that yoga causes the release of endorphins, natural painkillers and "feel good" chemicals in the brain. Studies show yoga can lower heart rate and blood pressure, increase muscle relaxation, and increase breathing capacity. Correction of hormonal profile is also observed. Yoga not only reduces trait anxiety in adolescents with PCOS but also may prevent the long-term squeal such as CVD, diabetes etc. Further, yoga as a self corrective therapy is potentially more cost-effective and enduring. Hence we recommend yoga as both a primary intervention and/or as adjunct to standard medical care.

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