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EFFECT OF YOGA ON MANAGEMENT OF POLYCYSTIC OVARIAN SYNDROME (PCOS): A SYSTEMATIC REVIEW

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ABSTRACT

Background:

Nowadays, the polycystic ovarian syndrome is a widespread condition that affects women at their reproductive age. Women are considered to have significantly elevated amounts of insulin resistance, obesity, and higher levels of androgens within the part of the body with PCOS. The crucial thing about overcoming these signs and symptoms of illness is weight management. It has a primary preventive and healing ability that can be accomplished by implementing lifestyle changes to fight this disease.

Yogic interventions are the primary key that continues a person's health and modifies the endocrine system. Postures (*Asanas*), Breathing techniques (*Pranayama*) and meditation (*dhyana*) facilitate plenty in relieving the signs and symptoms of PCOS associated with an incorrect dwelling lifestyle and deep-rooted stress and holding the person high to combat with this sickness.

Purpose:

This Review study is aimed to review the trends in research conducted over a period of time frame. Only randomized Control Trials and Clinical Trials are subjected of interest in this study. Using PUBMED, Google Scholar and other Indian databases searches were performed using keywords "Yoga and PCOS" which yielded up to 31 relevant articles showing the effect of Yoga on PCOS.

Selections were made to include only studies published in peer reviewed journals and investigating effects of regular Yogic practices on hormonal imbalances, weight loss, stress reduction and various other related aspects pertaining to PCOS in these studies.

Summary and Outlook:

Noteworthy variance was observed between the interventional group participants on the domain of hormones, weight loss, Anxiety, Stress and physical function with better results in Yoga groups than in control group. Collectively these studies suggest that specific Yogic

module may help to balance hormone, reduce body weight and released stress and it may improve the physical function of the body.

17
18 *Keywords: Yoga, Stress, PCOS and Hormones*

19 20 **1. INTRODUCTION**

21
22 A very common condition, Polycystic Ovarian Disease (PCOD), also known as Polycystic
23 Ovary Syndrome (PCOS), affects 5% to 10% of women in the 12-45 age group.¹⁸

24 Polycystic ovary syndrome (PCOS) is a complex condition characterized by elevated
25 androgen levels, menstrual irregularities, and/or small cysts on one or both ovaries. The
26 disorder can be morphological (polycystic ovaries) or predominantly biochemical
27 (hyperandrogenemia). Hyperandrogenism, a clinical hallmark of PCOS, can cause inhibition
28 of follicular development, microcysts in the ovaries, anovulation, and menstrual changes.
29 (Ndefo et al., 2013)

30 Yoga is a full body and mind prescription that can eradicate the root cause of PCOS, i.e.,
31 Stress and obesity. In addition, Yoga is a fantastic tension buster stress in women's lives
32 that can also lead to an unnecessary rise in weight. Entering a peaceful state decreases the
33 production of cortisol, a stress hormone that is one of the most significant causes of fat
34 accumulation in the body. Yoga ultimately advocates a move beyond the comfort zone to
35 optimistically better understand one's self from a very different viewpoint. Ultimately, it
36 contributes to improved quality of life.³

37 Because of genetics, obesity, drugs, aging, pregnancy and lifestyle, these variables build
38 insulin resistance. Altered metabolism of steroid hormones and lipid metabolism can develop
39 PCOS. Signs and symptoms of PCOS can involve menstrual disruption (primary
40 amenorrhea, secondary amenorrhea, oligomenorrhea). Infertility (due to lack of ovulation.),
41 high level of masculinizing hormones (acne, hirsutism, hypermenorrhea) metabolic
42 syndrome (obesity, resistance to insulin) and several other symptoms such as: oily skin,
43 dandruff.

44 PCOS-Adolescent Diagnostic Appearance - Menstrual Irregularity, Cosmetic problems, i.e.,
45 Reproductive acne, hirsutism and hair loss- Infertility, Early Pregnancy Loss, Menopausal
46 Syndrome, and Ca Endometrium during pregnancy (PIH and GDM) .¹⁴A close association
47 between obesity, stress and PCOS exists. About 50-60 percent of PCOS women are obese.
48 With prevalence rates ranging from 2.2 percent to as high as 26 percent, PCOS is the most
49 common female endocrine disorder. Both genetic predisposition and life style variables are
50 thought to contribute to PCOS etiology. Altered life pattern involving a high calorie diet and
51 lack of exercise contributing to obesity and insulin resistance, which has been well
52 established as an exacerbating factor for PCOS.² Studies have shown that sympathetic
53 function is chronically activated as a consequence of stressful life.

54 55 56 **1.1 YOGA**

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58 Yoga comes from the root, symbolizing the unification with the cosmic consciousness of
59 one's own consciousness. Regular Yoga practice has been shown at a functional level to
60 promote strength, stamina, and flexibility and produce qualities of generosity, compassion,
61 and better self-control and tranquility. Yoga practice induces a physiological state of rest and
62 relaxation that activates the parasympathetic nervous system (instead of the flight-or-fight

63 stress response) and can achieve a sense of equilibrium and union between the mind and
64 body.

65 An eightfold path to enlightenment is illustrated by *Patanjali Yoga Sutras*, from socio-
66 emotional wellbeing to physical and mental health, ending with spiritual liberation. Through
67 the use of the *Asanas* and *Pranayama*, *Hatha Yoga* strengthens the ability of the physical
68 body. *Hatha Yoga's* breathing methods prolong inhalation, holding of breath, and exhalation.
69 It is through the convergence of the *Sharira*, *Prana*, and *Mana* that blocks in the *Prana*
70 channels are cleared when performing *Asanas*. The system then reaches equilibrium. This is
71 particularly useful for a lifestyle condition that hinders the body's normal functioning.
72 According to Yoga ideology, stress or psychosomatic disorders are the cause of any illness
73 in the human body. The most prominent mental symptoms of PCOS are depression and
74 anxiety, according to the literature, while mood and anxiety disturbances are the most
75 prevalent clinical diagnosis of PCOS. ^(15, 16).

76 Although the system of Yoga is not developed for the purpose of treatment, it has been
77 observed through the applied researches shows evidence that the regular practice of Yoga
78 not only controls this disease but also promotes and maintain the healthy condition of the
79 body and mind and prevents the disease progression. Yoga has a potential to tranquilize
80 and balance the mind, which is the main key in the management of stress disorders.

81 **1.2 SIGNIFICANCE OF YOGA ON PCOS (RATIONALE):**

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83 Yoga science is based on the root cause, i.e., stress and obesity, of PCOS. Yoga is often
84 more holistic than just the physical body level. Yoga helps profoundly accumulated stress to
85 be released by the system, which can further strengthen PCOS symptoms.

86 1. Doing weight-bearing poses strengthens muscles. In fact, enhanced muscle mass leads
87 to the fight against insulin resistance, one of the links to PCOS regulation.

88 2. Yoga's daily practice increases the heart rate, provides cardiovascular activity and leads
89 to the loss of weight.

90 3. Hormonal balance and deep relaxation are facilitated by asanas and pranayama, helping
91 to increase adrenal and cortisol levels.

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94 **2. MATERIAL AND METHODS**

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96 Search articles for this systematic review were identified by using PUBMED, Google Scholar
97 and general Google search which yielded total 31 research papers which met our inclusion
98 criteria. Out of which 5 were found to be duplicate articles, 5 articles include different pathies
99 with Yoga as an intervention, one study was a clinical roundup study, 9 were review articles,
100 one article with other language are excluded from our study. Only Randomized Control Trials
101 and Clinical Trials are subjected to this review study. Which were published in English, had
102 clear diagnostic criteria for PCOS Patients. Out of 12 articles available on Google Scholar, 8
103 articles were available on PUBMED which are short-listed. (Fig 4.3)

104 After scrutinizing 31 articles, 09 trials were selected as they met criteria for final review.

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106 **2.1 INCLUSION CRITERIA:**

107 1. Studies included Randomized control trial and Clinical trial.

- 108 2. Published in English, between the years from 2001-2020.
- 109 3. Age group 12–55 years suffering from PCOS.
- 110 4. Investigating only effect of Yoga on obesity, hormones, glucose metabolism, stress
111 and physical activity.

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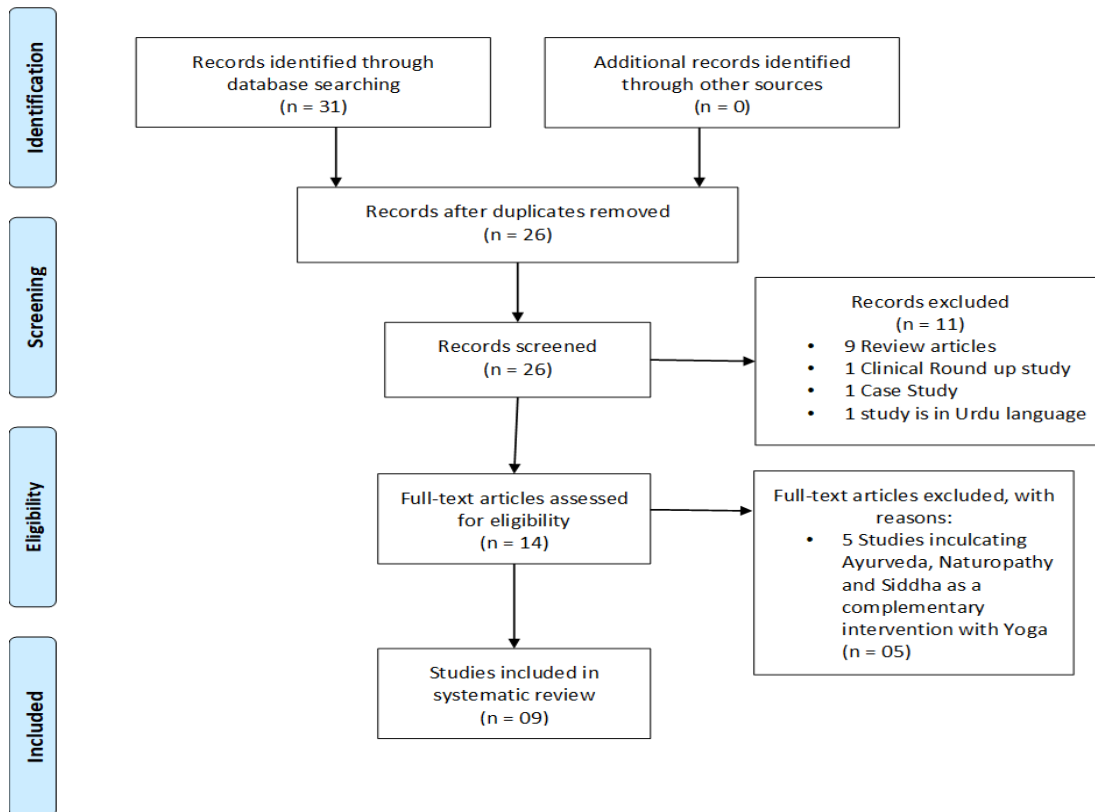
113 **2.2 EXCLUSION CRITERIA:**

114 Studies were excluded if -

- 115 1. Studies which include other interventions like naturopathy, Ayurveda and siddha.
- 116 2. Age ranges above 55 and suffering from other menstrual disorders
- 117 3. Literary review articles.
- 118 4. Paper published before 2001.
- 119 5. Duplicate articles are excluded.

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154 **4.3** FIGURE: SCHEMATIC REPRESENTATION OF STUDY SEARCHING AND
155 SELECTION AS PER CRITERIA.
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162 **3. RESULTS AND DISCUSSION**

163 **3.1** RESULT:

164 Search yielded a total of 31 trials, of which 09 met criteria for final review which shows a
165 significant difference between Yoga group and control group in terms of hormones, weight
166 balance, stressed level and physical activity. Yoga was found to be more effective than
167 conventional physical exercises in improving glucose, lipid, and insulin values, including
168 insulin resistance values.
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171 Yoga can play important role in the prevention & management of PCOS. Yoga can maintain
172 the Physiology of H-P-O axis.17 Yoga is one of the important refreshing and rejuvenating
173 modalities which can content and even root out stress completely. Since stress is playing
174 important factor in exaggerating PCOS, Yoga help to regulate the endocrine glands in body
175 there by beneficial in balancing of hormones Yoga is effective in keeping your ovary &

176 Uterus healthy. Yoga is precious gift which can enrich human life. In PCOS, Yoga plays a
177 crucial role in regulating hormones by reducing androgens and promoting the development
178 of eggs. Yoga relieves stress it promotes weight loss and also increases fertility and with the
179 help of Yoga gastrointestinal imbalance is also improve. Asana help to stretch the pelvic
180 area and pranayama and meditation sooth the mind.

181 Asanas (Yoga postures) for polycystic ovary syndrome help to loosen up the pelvic region
182 and facilitate relaxation, and pranayamas (breathing exercises) are important strategies that
183 help to calm the mind. Coupled with few calming meditations that act at a very deep level
184 and enable the whole system to De-toxify and de-stress.

185 Researches have shown very significant changes in Yogic intervention group. Yoga: -

- 186 • Reduced distress feelings
- 187 • Increased sensitivity to insulin
- 188 • Equilibrated amounts of androgen
- 189 • Enhanced Hirsutism
- 190 • Led to significant regularity of menstruation

191 **3.2 DISCUSSION:**

192 **Literature Review:**

193
194 The Randomized control Study conducted by Chattha R et al., 2008 .Hot flushes and
195 night sweats could enhance by holistic approach to Yoga therapy. Cognitive functions
196 such as remote memory, mental control, attention and concentration, delayed and
197 immediate recall, verbal retention and tests for identification may also be improved.¹ The
198 randomized controlled study by Laxmi et al., 2018 which objectifies to analyze and
199 discuss about the impact of Yoga on women's suffering from PCOS. And the result of
200 this study shows that Symptoms such as weight gain, cysts or fibroids in the uterus,
201 irregular menstrual cycle, unwanted facial hair, and emotions are reduced after 3 months
202 of Yoga practice. The overall quality of life improvement is reflected in the form of
203 symptoms such as weight reduction, reduction in unusual hair loss, elevated menstrual
204 bleeding, cramps, fat, constipation, and the reduction of emotional disturbances.⁴ hence
205 this study has shown the very significant impact of Yoga on females. Study by Ram
206 Nidhi et al.. 2013 shows that: A 12-week holistic Yoga program is considerably better
207 than physical activity in minimizing AMH, LH, and testosterone, mFG hirsutism ranking,
208 and non-significant menstrual frequency enhancement. In adolescent PCOS,
209 improvements in bodyweight, FSH, and prolactin.⁶

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211 In the 2 groups of study by Ram Nidhi et al..2012 on the effect of glucose metabolism
212 and body lipid level in adolescent's girls with PCOS , the changes in fasting insulin,
213 fasting blood glucose, and homeostasis model evaluation of insulin resistance were
214 substantially different. Yoga in adolescent girls with PCOS individual with anthropometric
215 improvements was found to be more effective than conventional physical exercises in

216 improving glucose, lipid, and insulin values, including insulin resistance values.⁸
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 218 According to study conducted by Nidhi r. et al. 2012 ,A holistic Yoga program for
 219 adolescents with PCOS for 12 weeks is significantly better than a physical exercise
 220 program for reducing symptoms of anxiety.⁹
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 222 Women that had completed the mindful thrice-week intervention of Yoga in randomized
 223 controlled study of Patel V et al.. 2020 had resulted slightly lower levels of free
 224 testosterone. Improved testosterone, lower trend in dehydroepiandrosterone levels. In
 225 addition, improvements in depression and anxiety interventions were observed.¹⁰
 226
 227 After the intervention of study conducted by Selvaraj V et al.. 2020, psychological factors
 228 such as the menstrual cycle, blood flow during periods of cramps, pimples, hair fall,
 229 fatigue and weight gain have improved. Most girls showed more energy and were
 230 relieved from depression. It is also essential that exercise and Yoga, since it includes
 231 both body and mind, can undoubtedly enhance the psychological aspects of any
 232 person.¹² Sode JA et. al 2017 Yoga therapy among women suffering from infertility may
 233 be potentially useful in improving anxiety scores.¹⁴ Vanitha A et al.. 2018 After Yoga
 234 training, the degree of stress and depression is low relative to the pre-test state (Before
 235 Yoga training).¹⁶

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 239 **4. CONCLUSION**

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 241 The most common health issue in women of reproductive age is polycystic ovarian
 242 syndrome. Women diagnosed with PCOS have profound resistance to insulin, obesity and
 243 elevated androgen levels. The main key to keeping people safe is the Yoga therapies listed
 244 in several trials. After studying these papers, we may conclude the following practices that
 245 may help in PCOS and may improve their other comorbidity like stress, hypertension etc.:
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248 **4.1 TABLE OF RECOMMENDED YOGA PRACTICES:**

Shatkarma	❖ <i>Vaman Dhauti, Kapalbhati</i>
Asana	1. Standing– <i>Tiryaktadasana, katichakrasana</i> 2. Sitting- <i>Padmasana, Bhadrasana, Ustrasana</i> <i>,Malasana</i> 3. Prone - <i>Bhujangasana , Dhanurasana</i> <i>,Makarasana</i> 4. Supine – <i>Setubandhasana, Ardhalasana ,Shavasana</i>
Pranayama	❖ <i>Anulom Vilom ,Bhramari , and Ujjayi</i>
Mudra	❖ <i>Vipreetkarani Mudra</i>
Dhyana /Yog Nidra	❖ <i>Om Meditation</i>

251 **Supportive basis of certain practices taken in above protocol:**

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253 **Shatkriya (cleansing practices)** helps to detoxify the impure toxins from the body and is
254 very effective in the management of obese person. **Asanas (physical postures)** helps to
255 balance the whole endocrine system by direct massaging the ovarian glands and improve
256 the blood circulation there by regulates the menstruation cycle. **Pranayama (breathing
257 regulation)** helps to balance both the brain hemispheres and induces relaxation of mind &
258 body.⁵ **Mudra (gestures)** helps to redirect the *prana* within the affected body organ and
259 improves flow of *prana* and blood there. **Yoga Nidra / Dhyana (Meditation)** Both Meditation
260 and Yoga Nidra assist in the activation of the calming reflex and the enhancement of
261 nervous system and endocrine system function, which affects hormones, as well as
262 decreasing anxiety and enhancing mood.

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264 **5. STUDY LIMITATION**

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266 Studies have been carried out in different demographic areas, which prompt the issue of the
267 study's findings being generalizable. However, the fact a randomized control trial with a large
268 sample participating in each arm provides evidence for the intervention
269 being more effective. Our searches were limited to few databases only, wide range of
270 databases are needed in this context Studies should consider a longer period of follow to
271 check long term efficacy & long-term acceptability to observe the Changes in the number of
272 ovaries and follicle size. A lot of studies are not PubMed indexed. They are to be searched
273 from various sources. This consumes a lot of time.

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275 **6. FINANCIAL SUPPORT AND SPONSORSHIP**

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277 This research did not receive any specific grant from funding agencies in the public,
278 commercial, or not-for-profit sectors.

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280 **7. CONFLICTS OF INTEREST**

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282 There are no conflicts of interest.

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284 **8. AUTHORS' CONTRIBUTIONS**

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286 1. Divya Singh: Conception or design of the work, Data collection, Data analysis and
287 interpretation and drafting the article.

288 2. Kautuk Kishore Chaturvedi: Review of final manuscript

289 3. Shalini Singh: Review of final manuscript.

290 4. Dr. S. Lakshmi Kandan: Conceptualization, Expert opinion, critical revision of
291 manuscript

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293 The authors read and approved the final manuscript.

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APPENDIX

S.no.	1st author, Year, Place	Design	Objective	Sample size	Intervention for experimental group (with duration)	Measurable outcome & results	Limits & recommendation
1	Vishesha Patel et al., 2020, Erie County, Pennsylvania, U.S	Randomized Control Study	Regular Mindful Yoga Practice as a Method to Improve Androgen Levels in Women With Polycystic Ovary Syndrome	<ul style="list-style-type: none"> ➤ 30 females suffering from PCOS. ➤ Sampling method was purposive ➤ sampling in Age range was 25-35 years. 	<ul style="list-style-type: none"> ➤ (3-part Yogic breath): Ujjayi breath, ➤ Alternate nostril breathing, and ➤ Breath of fire, ➤ Vinyasa flow Yoga, ➤ Restorative Yoga <i>asanas</i>, ➤ Guided meditation imagery of healing energy and mindful "I am" statements. (For 3 Months.) 	<ul style="list-style-type: none"> ➤ ↓ Free testosterone levels ➤ ↓ Dehydroepiandrosterone Levels. 	NIL
2	Valarmathi Selvaraj et al., 2020, Tamil Nadu	A comparative and post design	To identify the risk for adolescent school girls with (PCOS), assess their risk status, and evaluate the impact of lifestyle	<ul style="list-style-type: none"> ➤ A total of 204 (control-102; experimental-102) girls Of AP. 	<ul style="list-style-type: none"> ➤ Yoga and exercise (for two months.) 1. Pranayama, 2. Meditations, 3. <i>Bhadrasana</i> (Butterfly pose), 4. <i>Chakki Chalanasana</i> (moving the grinding wheel). Brisk walking exercise for control group. 	<ul style="list-style-type: none"> ➤ Yoga and exercise were beneficial in minimizing PCOS risk, as reflected in the risk assessment score. 	NIL

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S.no.	1st author, Year, Place	Design	Objective	Sample size	Intervention for experimental group (with duration)	Measurable outcome results	Limitation & recommendation
3	Vanitha .A et al.,2018, Tamil Nadu	Interventional Study	Effect of <i>Yoga nidra</i> on resting cardiovascular parameters in polycystic ovarian syndrome women	40 PCOS women. Age between 18 and 35years	<i>Yoga nidra</i> intervention (in the lying position daily once for the period of 40 min ;for 12 weeks)	Show favorable changes in: <ul style="list-style-type: none"> ➤ BP, ➤ HR, and ➤ Other Anthropometric parameters 	Larger sample size Would be better study design.
4	Laxmi et al.,2018, Patanjali, Haridwar	Randomized control study	The objective of the study is to analyze and discuss about the impact of Yoga on Women's (PCOD) & their quality of life.	Selected 32 Subjects of PCOD out of 409 infertility patients. Two groups are formed 16 in each of experimental and control groups. The experimental group followed 40 min Yoga practices daily for 6 days in a Week for 12weeks.	Asana Time (in mins) for 12weeks <ul style="list-style-type: none"> ➤ <i>Padmasana/sukhsana</i> - 5 ➤ <i>Suryanamkar</i>(sun posture) -15 ➤ <i>Bhadrasana</i>(Butterfly posture)-5 ➤ <i>Savasana</i> (corpse posture) - 5 ➤ <i>AnulomVilome</i>(Alternate Nostril breathing)-5 ➤ <i>Bhramari</i> (Humming bee sound) - 5 	Those who practiced Yoga have significantly: <ul style="list-style-type: none"> ➤ ↓Weight, ➤ ↓No. of cysts, ➤ ↓Irregular menstrual cycle ➤ ↓Emotional disorders 	Results encourages Further research work in the field of PCOD.

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S.no.	Ist author ,Year, Place	Design	Objective	Sample size	Intervention for experimental group(with duration)	Measurable outcome & results	Limitation & recommendation
5	Jaimala.A Sode et al.,2017, maharashtra	Comparative study with pre and post design	To study the Effect of Yoga on Level of Depression among Females suffering from Polycystic Ovarian Syndrome (PCOS)	<ul style="list-style-type: none"> ➤ 30 females suffering from PCOS. ➤ Sampling method was purposive sampling. ➤ The age ranges between 25 –35 Years. 	Yoga Training was conducted for a month's period: 1. <i>Bhadrasana</i> (Butterfly pose) 2. <i>Bharadvajasana</i> (Bharadvja's Twist) 3. <i>Bhujangasana</i> (Cobra pose) 4. <i>Navasana</i> (Boat pose) 5. <i>Padmasana</i> 6. <i>Dhanurasana</i> (Bow pose) 7. <i>ViparitaShalabhasana</i> (Superman pose) 8. <i>Chakri Chakrasana</i> (moving the grinding wheel) 9. <i>Sun Salutation</i> (Surya Namaskar) 10. <i>Shavasana</i> (Corpse pose) 11. <i>Bhramri Pranayama</i> 12. Meditation	<ul style="list-style-type: none"> ➤ ↓ Level of depression 	of NIL

S.no.	1st author Year, Place	Design	Objective	Sample size	Intervention for experimental group(with duration)	Measurable outcome & results	Limitation & recommendation	
6	Ram Nidhi et al. 2012, Andhra Pradesh	Randomized Control Study	To study the effect of holistic Yoga program on anxiety symptoms in adolescent girls with polycystic ovarian syndrome	<ul style="list-style-type: none"> > Adolescent girls aged 15 to 18 years of AP. > Satisfied Rotterdam criterion (2/3 of the features) for PCOS. > 90 participants were randomly divided into 2 study arms: <ul style="list-style-type: none"> > 1 practiced Yoga and the other arm practiced conventional physical exercises for the same Duration. 	<p>Both groups practiced their respective set of practices, 1 h daily, 7 days a week for 12 weeks:</p> <ol style="list-style-type: none"> 1. Group lecture 2. Lectures in the form of cognitive restructuring based on spiritual philosophy underlying Yogic concept. 3. Surya namaskar sun salutation 4. Prone Asanas: <ul style="list-style-type: none"> • Cobra pose (<i>Bhujangasana</i>) • Locust pose (<i>Shalabhasana</i>) • Bow pose (<i>Dhanurasana</i>) 5. Standing Asanas: <ul style="list-style-type: none"> • Triangle Pose (<i>Trikonasana</i>) • Twisted Angle Pose (<i>Parshava Konasana</i>) • Spread leg intense stretch. (<i>Prasariti Padottanasana</i>) 	<ol style="list-style-type: none"> 6. Supine Asanas: <ul style="list-style-type: none"> • Shoulder Stand (<i>Sarvangasana</i>) • Plough Pose (<i>Halasana</i>) 7. Sitting Asanas: <ul style="list-style-type: none"> • Sitting Forward Stretch (<i>Paschimottasana</i>) • Fixed angle pose (<i>Badha konasana</i>) • Garland Pose (<i>Malasana</i>) 8. Guided Relaxation (<i>Shavasana</i>) 9. Breathing techniques (<i>Pranayama</i>) <ul style="list-style-type: none"> • Sectional breathing (<i>Vibhagiya Pranayam</i>) • Forceful exhalation (<i>Kapalbhati</i>) • Right Nostril breathing (<i>Suryanulom vilom</i>) • Alternate Nostril breathing (<i>Nadi Shuddhi</i>) 10. OM Meditation (<i>OM Dhyana</i>). 	Holistic Yoga program is better than physical exercises	A randomized control trial with a large sample participating in each arm provides evidence for this intervention being effective.

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S.no.	1st author, Year, Place	Design	Objective	Sample size	Intervention for experimental group (with duration)	Measurable outcome results	Limitation & recommendation
7	Ram Nidhi et al.; 2012, Andhra Pradesh	Randomized Control Study	Effect of a Yoga program on glucose metabolism and blood lipid levels in adolescent girls with PCOS.	<p>Recruited 90 adolescents aged between 15 to 18 years who met the Rotterdam criteria for PCOS.</p>	<p>A yoga group Practiced <i>suryanamaskara, asanas, pranayama, and meditation</i> 1 hour per day each day for 12 weeks.</p> <p>While another group practiced conventional physical exercises. The Mann Whitney U test was used to compare score changes between the 2 groups.</p>	<p>Yoga is better than physical exercise in:-</p> <ul style="list-style-type: none"> ➤ Improving glucose, Lipid, and ➤ Insulin values, including insulin resistance values. 	NIL

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S.no	1st author ,Year, Place	Design	Objective	Sample size	Intervention for experimental group (with duration)	Measurable outcome & results	Limitation & recommend- ation
8	Ram Nidhi et al.,2012, Andra Pradesh	Randomize d Control Study	The objectives of this trial were to compare the effects of a holistic Yoga program with the convention al exercise program in adolescent polycystic ovarian syndrome (PCOS).	Ninety (90) adolesc ent (15- 18 years) girls	<p>Yoga group practiced a holistic Yoga module:</p> <ol style="list-style-type: none"> 1. Group lecture 2. Lectures in the form of cognitive restructuring based on spiritual philosophy underlying Yogic concept. 3. <i>Surya namaskar</i> sun salutation 4. Prone Asanas: Cobra (<i>Bhujangasana</i>) Locust (<i>Shalabhasana</i>) Bow (<i>Dhanurasana</i>) <p>5. Standing Asanas: Triangle (<i>Trikonasana</i>) Twisted Angle Pose (<i>Parshava Konasana</i>) Spread leg intense stretch. (<i>Prasarit Padattanasana</i>) <p>6. Supine Asanas: Shoulder (<i>Sarvangasana</i>) Plough Pose (<i>Halasana</i>) <p>7. Sitting Asanas: Sitting Forward Stretch (<i>Paschimottanasana</i>) Fixed angle pose (<i>Badhha konasana</i>) Garland Pose (<i>Malasana</i>) 8. Guided Relaxatio (<i>Shavasana</i>) 9. Breathing techniques (<i>Pranayama</i>) Sectional breathing (<i>Vibhagiya Pranayam</i>) Forceful exhalation (<i>Kapalbhati</i>) Right Nostril breathing (<i>Suryanulom vilom</i>) Alternate Nostril breathing (<i>Nadi Shuddhi</i>) 10. OM Meditation (<i>OM Dhyanam</i>). <p>The control group practiced a matching set of physical exercises (1 hr/day, for 12 weeks).</p> </p></p></p>	<p>Yoga is helpful in : AMH, LH, and testosterone, mFG score for hirsutism. Improving menstrual frequency.</p>	NIL

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S.no	1st author, Year, Place	Design	Objective	Sample size	Intervention for experimental group (with duration)	Measurable outcome & results	Limitation & recommendation
9	Chattha R et al., 2008, S VYASA, Bangalore	Randomized control study	To assess the efficacy of an integrated approach of Yoga therapy (IAYT) on cognitive abilities in Climacteric syndrome.	> Women between 40 and 55 years with follicle-stimulating hormone level \leq 15 mu/ml. 120 perimenopausal women were randomly allotted into the Yoga and the control groups.	Yoga group practiced a module comprising. > Breathing practices, > Sun Salutation and > Cyclic Meditation,	Yoga: > Improve hot flushes and night sweats. > Improve cognitive functions	Restricted to English speaking women's

APPENDIX – 2

S.no.	1st author ,Year, Place	Intervention for experimental group
1	Vishesha Patel et al.,2020,Erie County, Pennsylvania,U.S	<ol style="list-style-type: none"> 1. Ujjayi breath, 2. Alternate nostril breathing, and 3. Breath of fire, <ul style="list-style-type: none"> ➤ Vinyasa flow yoga, ➤ Restorative yoga asanas, ➤ Guided meditation imagery of healing energy and mindful “I am” statements.
2	Vanitha .A et al.,2018,Arumbakkam, Chennai,Tamil Nadu	<i>Yoga nidra</i>
3	Laxmi et al.,2018,Patanjali, Haridwar	<ul style="list-style-type: none"> ➤ <i>Padmasana/sukhsana</i> - 5 ➤ <i>Suryanamkar</i>(sun posture) -15 ➤ <i>Bhadrasana</i> (Butterfly posture)-5 ➤ <i>Savasana</i> (corpse posture) - 5 ➤ <i>AnulomVilome</i> (Alternate Nostril breathing)–5 ➤ <i>Bhramari</i> (Humming bee sound) - 5
4	Jaimala.A Sode et al.,2017, maharashtra	<ol style="list-style-type: none"> (i)Bhadrasana (Butterfly pose) (ii) Bharadvajasana (Bharadvja’s Twist) (iii) Bhujangasana (Cobra pose) (iv) Naukasana (Boat pose) (v) Padmasana (vi) Dhanurasana (Bow pose) (vii) ViparitaShalabhasana (Superman pose) (viii) Chakki Chalanasana (moving the grinding wheel) (ix) Sun Salutation (Surya Namaskar) (x) Shavasana (Corpsse pose) (xi) Bhramri Pranayama (xii) Meditation

S.no.	1st author ,Year, Place	Intervention for experimental group
5	Ram Nidhi et al.,2012, Andhra Pradesh	<ol style="list-style-type: none"> 1. Group lecture 2. Lectures in the form of cognitive restructuring based on spiritual philosophy underlying yogic concept. 3. Surya namaskar sun salutation 4. Prone Asanas: <ul style="list-style-type: none"> • Cobra pose (Bhujangasana) • Locust pose (Shalabhasana) • Bow pose (Dhanurasana) 5. Standing Asanas: <ul style="list-style-type: none"> • Triangle Pose (Trikonasana) • Twisted Angle Pose (Parshava Konasana) • Spread leg intense stretch (Prasarit Padottanasana) 6. Supine Asanas: <ul style="list-style-type: none"> • Shoulder Stand (Sarvangasana) • Plough Pose (Halasana) 7. Sitting Asanas : <ul style="list-style-type: none"> • Sitting Forward Stretch (<i>Paschimottanasana</i>) • Fixed angle pose (<i>Badhha konasana</i>) • Garland Pose (<i>Malasana</i>) 8. Guided Relaxation (<i>Shavasana</i>) 9. Breathing techniques (<i>Pranayama</i>) <ul style="list-style-type: none"> • Sectional breathing (<i>Vibhagiya Pranayam</i>) • Forceful exhalation (<i>Kapalbhati</i>) • Right Nostril breathing (<i>Suryanulom vilom</i>) • Alternate Nostril breathing (<i>Nadi Shuddhi</i>) 10. OM Meditation (<i>OM Dhyana</i>).
6	Ram Nidhi et al.;2012, Andhra Pradesh	<ul style="list-style-type: none"> ➤ <i>Suryanamaskara,</i> ➤ <i>Asanas,</i> ➤ <i>Pranayama,</i> and ➤ <i>Meditation</i>

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S.no.	1st author ,Year, Place	Intervention for experimental group
8	Valarmathi Selvaraj et al.;2020 ,Tiruvallur district of Tamil nadu	<ol style="list-style-type: none"> 1. <i>Pranayama</i>, 2. Meditations, 3. <i>Bhadrasana</i> (Butterfly pose), 4. <i>Chakki Chalanasana</i> (moving the grinding wheel).
9	Ram Nidhi et.al.;2012,Andra Pradesh	<p>➤ Holistic yoga module for Yoga group:</p> <ol style="list-style-type: none"> 1. Group lecture 2. Lectures in the form of cognitive restructuring based on spiritual philosophy underlying Yogic concept. 3. <i>Surya namaskar</i> sun salutation 4. Prone <i>Asanas</i>: <ul style="list-style-type: none"> • Cobra pose (<i>Bhujangasana</i>) • Locust pose (<i>Shalabhasana</i>) • Bow pose (<i>Dhanurasana</i>) 5. Standing <i>Asanas</i>: <ul style="list-style-type: none"> • Triangle Pose (<i>Trikonasana</i>) • Twisted Angle Pose (<i>Parshava Konasana</i>) • Spread leg intense stretch (<i>Prasarit Padottanasana</i>) 6. Supine <i>Asanas</i>: <ul style="list-style-type: none"> • Shoulder Stand (<i>Sarvangasana</i>) • Plough Pose (<i>Halasana</i>) 7. Sitting <i>Asanas</i> : <ul style="list-style-type: none"> • Sitting Forward Stretch (<i>Paschimmottanasana</i>) • Fixed angle pose (<i>Badhha konasana</i>) • Garland Pose (<i>Malasana</i>) 8. Guided Relaxation (<i>Shavasana</i>) 9. Breathing techniques (<i>Pranayama</i>) <ul style="list-style-type: none"> • Sectional breathing (<i>Vibhagiya Pranayam</i>) • Forceful exhalation (<i>Kapalbhati</i>) • Right Nostril breathing (<i>Suryanulom vilom</i>) • Alternate Nostril breathing (<i>Nadi Shuddhi</i>) 10. OM Meditation (<i>OM Dhyana</i>). <p>➤ A matching set of physical exercises for Control group.</p>