International Journal of Community Medicine and Public Health
Kasthuri A et al. Int J Community Med Public Health. 2026 Jul;13(7):3815-3826
https://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20262288

Original Research Article

Impact of traditional Indian practices combined with modern medicine on physiological and lifestyle parameters in reproductive-age women with polycystic ovarian disease: a comparative interventional study

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Received: 08 May 2026
Revised: 09 June 2026
Accepted: 11 June 2026

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ABSTRACT

Background: Polycystic ovarian disease (PCOD) is a most common endocrine disorder among women of reproductive age, closely linked to metabolic, lifestyle, and psychological factors. This study investigated the additional impact of incorporating selected ancient traditional Indian practice mindfulness of the Mooladhara chakra and Kayakalpa yoga- alongside MMRT. Objective was to compare changes in physiological and lifestyle parameters over one year between two groups of PCOD women- those receiving only MMRT (group 1) and those receiving yogic intervention as an adjunct to MMRT (group 2).
Methods: A one-year comparative interventional study was conducted on 131 women aged between 15 to 45 years, diagnosed with PCOD using Rotterdam's criteria. Group 1 (n=63) received MMRT alone, while group 2 (n=68) received MMRT plus the Mooladhara chakra and Kayakalpa yogic intervention were given and assessed.
Results: Both groups were demographically comparable. Group 2 showed a clinically meaningful decrease in BMI, waist-hip ratio, HbA1c, and ovarian volume. Menstrual regularity and ovulation rates significantly improved in group 2 ($p<0.001$). Lifestyle improvements including reduced junk food intake, better protein intake, improved sleep and healthier oil usage were more prominent in group 2.
Conclusions: Integrating traditional yogic practices with standard medical therapy offers multidimensional benefits in PCOD management. While not a substitute for pharmacologic treatment, these interventions effectively support metabolic, hormonal, and lifestyle regulation. Further research with larger samples and randomized design is recommended to validate these findings.

Keywords: Insulin resistance, Kayakalpa yoga, Lifestyle intervention, Menstrual regularity, Mooladhara chakra, Ovulation, PCOD, PCOS, Traditional Indian practices, Yoga

INTRODUCTION

Polycystic ovarian disease (PCOD) is the most common and complicated endocrine disorder in reproductive age women. The etiology of the PCOS though unknown, it is multigenetic disorder corresponding to diet and lifestyle factors. Depending on ROTTERDAMS PCOD diagnostic criteria, this disorder affects about 6% to 20% of reproductive age women aged 15-45 years.[1] Typical features include increased weight gain, central obesity,

increased waist -hip ratio and Irregular menstrual cycles and decreased rate of ovulation and thereby infertility.[2] The majority of women exhibit physiological dysfunction, which is characterized by insulin resistance and compensatory hyperinsulinemia. Hyperandrogenism, ovulatory dysfunction, menstrual irregularity are the main criteria used to make diagnosis of PCOS.

Modern medicine regime of treatment aims to treat physiological abnormalities through lifestyle modifications, medication especially metformin, for the prevention and management of excess weight and androgen suppression. Assisted reproductive therapy for infertility issues and the identification and treatment of psychological features which are customized to the patient's needs and complaints.[3] Weight loss is difficult to achieve in PCOD cases even after medication and sustaining the lost weight is also very difficult in a long run. It is shown that alteration in diet combined with exercise and a minimal weight loss leads to ovulation within weeks, with long term restoration of reproductive potential.[4,5] Studies suggest that women who achieve greater reductions in central fat and insulin resistance shows the greater sustainability with weight loss and thereby reducing metabolic abnormalities. Thus, lifestyle interventions which helps in simultaneously reducing the insulin resistance and improve body fat composition, definitely helps to optimize outcomes in PCOS management independent of changes in weight status.[6,7]

Thus, lifestyle is the first-line treatment for women with polycystic ovary syndrome (PCOS) and has advantages beyond weight loss, in glucoregulatory status, helping improve insulin sensitivity and helps in reversing PCOD outcomes especially fertility in reproductive age women.

Modern medicine regime of treatment (MMRT) stresses on the importance of medication, lifestyle style changes and exercise. But as an adjuvant to general exercises, focusing on hormonal balance should involve endocrinal gland regulation.

Till now no studies were carried out in PCOD women integrating MMRT with techniques for inner endocrine gland regulation. Henceforth in our study, a novel approach of "mindfulness of mooladhara chakra through visualization techniques and practicing kaya kalpa yoga in the sitting posture" as an adjuvant to MMRT was introduced as an intervention technique in PCOD reproductive age women of 15 to 45 years which is first of its kind in India.

This was an age-old traditional practice helping in regulation of the reproductive gland hormones stressing on the spirt-mind-brain-body approach of preventive medicine in restoring the HPO axis regulation thereby correcting the ovulatory dysfunction and regulation of menstrual cycles.

This study investigates whether integrating traditional Indian practices- specifically Mooladhara Chakra mindfulness and Kayakalpa Yoga- alongside MMRT can significantly improve physiological, endocrinal, and lifestyle outcomes in PCOD women over a one-year period.

This study aimed to assess the impact of traditional Indian practices combined with modern medicine on physiological and lifestyle parameters among reproductive age women diagnosed with PCOS. This study also compared changes in key physiological parameters (e.g., BMI, waist-hip ratio, insulin resistance (measured with HbA1C) in both groups over a one year period. This study also helped in evaluating the impact of intervention combined with modern medicine regime with lifestyle trends on treatment of menstrual regularity and ovulation rate, compared modern medicine regime of treatment alone.

METHODS

The 1-year interventional study have been conducted from June 2025 to May 2026, on the probable PCOS cases who attended the department of obstetrics and gynecology, SMMCH and RI and urban health training centre attached with the department of community medicine, SMMCH and RI. According to the Rotterdam's criteria, total sample size of the study was N=131. Out of this, two groups have been separated, N1=63, and N2=68. 63 PCOD patients who fulfilled the Rotterdam's criteria of PCOD from the obstetrics and gynecology department of SMMCHRI constituted group 1 and were followed up for one year. Women with clinical symptoms of PCOD but negative diagnosis in USG and those on ovulation induction therapy have been excluded from the study. Both married and unmarried women with cystic changes in ovary confirmed with USG and who gave the willingness to participate have been included in the study.

The intervention group of 68 PCOD patients were from the urban health centre of SMMCHRI, who fulfilled the Rotterdam's criteria of PCOD attached with the department of community medicine constituted group 2 were receiving MMRT for PCOD and also the intervention (practicing the mindfulness of mooladhara chakra and I cycle of kayakalpa yoga at sitting posture) are examined and their physiological and biochemical parameters obtained on day 1 and after 1 year.

The group 1 records PCOD patients followed with only modern medicines. The interventional group (group 2) conducted visualization of 2 steps, mindfulness of mooladhara chakra was inducted through verbal pre-recorded audio and video instructions. After watching the audio and video subjects are instructed to practice the following steps at UHTC Nandambakkam or at their place if they are unable to attend the centre due to personal reasons. Step 1: All emerging thoughts were tied into bunch with a knot. Subject could visualize the tied

knot as a red dot and the dot moving vertically down from head through the spinal cord to the base of spine, becoming heavy to blooms into red lotus. Subjects were instructed to visualize the red lotus at the base of spine for 2 minutes. Step 2: subjects were instructed to breathe through the red lotus at base of spine (mooladhara chakra) vertically and horizontally (5 breaths vertically, 5 horizontal) 2 minutes. Step 3: Subjects were instructed to visualize the red lotus has been energized and it heals the reproductive and pelvic organs especially ovaries and uterus. Step 4: instructed to feel happy for feminism (1 minute) 10b. one cycle of kayakalpa yoga in the sitting posture. Kayakalpa yoga: one cycle of Kayakalpa yoga uses 10 Ashwini mudras, which is contraction and relaxation of perineal muscles followed by contract of perianal sphincter during moola bandha and an ojus breath, which is one cycle of inspiration followed by expiration in tongue folded touching the base of upper palate.

Sampling technique

The present study utilized a combination of purposive sampling and random systematic sampling techniques. Initially, purposive sampling was employed to identify women diagnosed with PCOS who fulfilled the inclusion criteria and were willing to participate in the study. Eligible participants were selected from women attending the outpatient department of obstetrics and gynecology of the tertiary care hospital. Following enrolment, participants were selected using a random systematic sampling method to ensure unbiased representation of the study population. Subsequently, random allocation was carried out to assign participants into the control and intervention groups. Allocation was performed using computer-generated random numbers to minimize selection bias and to ensure equal opportunity for assignment into either group. The use of systematic random sampling and computerized allocation improved the internal validity and reliability of the study findings by reducing investigator-related bias.

Sample size determination

The sample size for the present study was calculated based on the difference between two proportions using data obtained from previous literature. The calculation was performed in accordance with STROBE guidelines for analytical observational and interventional studies.

The total estimated sample size for the study was 131 participants, comprising: group 1 (MMRT): 63 participants, group 2 (MMRT + MMNY): 68 participants.

The sample size estimation was based on the following assumptions:

P1 = proportion of ovulation induction with conventional treatment using clomiphene citrate and modern medical regime of treatment (MMRT), which was reported as 70% from previous studies.

P_2 = projected proportion of ovulation induction expected after adding the proposed intervention, namely Mindful Mooladhara and Novel Yoga (MMNY), along with MMRT. An anticipated additional benefit of 21% was considered, resulting in a projected success proportion of 91%.

Thus: P_1=70% =0.70, P_2=91% =0.91

The sample size was calculated using the formula for comparison of two proportions:

$$N = (Z_{\alpha/2}+Z_{\beta})^2\times[P_1(1-P_1) + P_2(1-P_2)])/(P_1-P_2)^2$$

Where:

$Z_{\alpha/2}$ = Critical value of normal distribution at 95% confidence interval

Z_{β} = Critical value corresponding to study power

P_1 = Proportion in control group

P_2 = Proportion in intervention group

The calculated sample size was found adequate to detect statistically significant differences between the two groups.

The study reported zero dropouts, and all participants completed the intervention and follow-up assessments successfully.

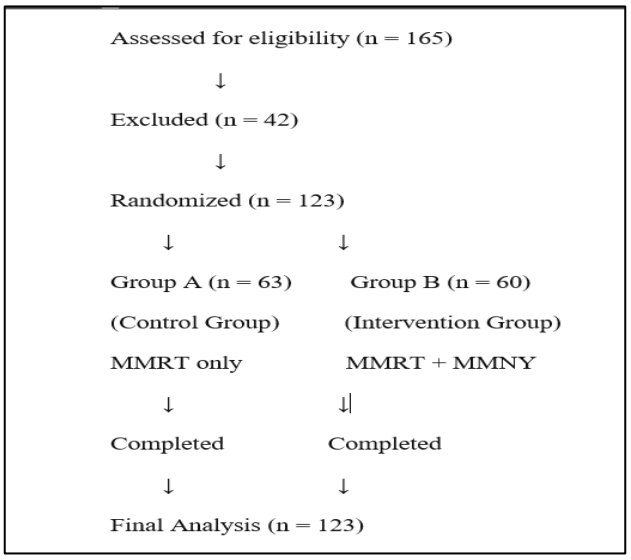

Figure 1: Flowchart of participant recruitment and allocation.

A structured questionnaire after pilot study had been used to collect information with section A consists of socio-

demographic profile section-B with physiological and biochemical, section C with endocrinal problems and psychological section-D with lifestyle parameter values of PCOD. These parameters are measured and recorded at baseline, at end of first, third, sixth, ninth and twelve months. SMMCH and RI central lab facilities were used to record the parameters, Proper permissions from the concerned in charges have been obtained. Values at baseline and 1 year were compared between 2 groups, as it was taken as study period. Confidentiality of patients have been maintained throughout the study. Informed consent obtained from each participant and, for adolescent girls' parental consent have been obtained. Ethical consideration of the study has been obtained from the institution. Independent sample t-test, Wilcoxon-signed rank test, Mann-Whitney U test and Chi square, fisher's exact test analysis was done using SPSS.

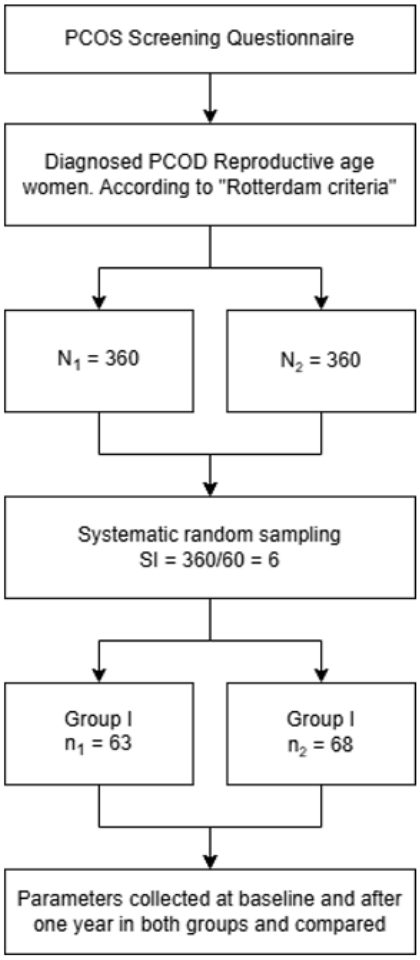

Figure 2: CONSORT flow.

RESULTS

The Kolmogorov-Smirnov test was used to assess the normality assumption for continuous variables. Variables with a p value greater than 0.05 were considered normally distributed. For normally distributed variables, an independent samples t-test was used to compare the means between two groups and a paired t-test was used to compare measurements between day 1 and one year later. For variables that were not normally distributed, the Mann-Whitney U test was used to compare the means between two groups, and the Wilcoxon signed-rank test was used to compare measurements between day 1 and one year later.

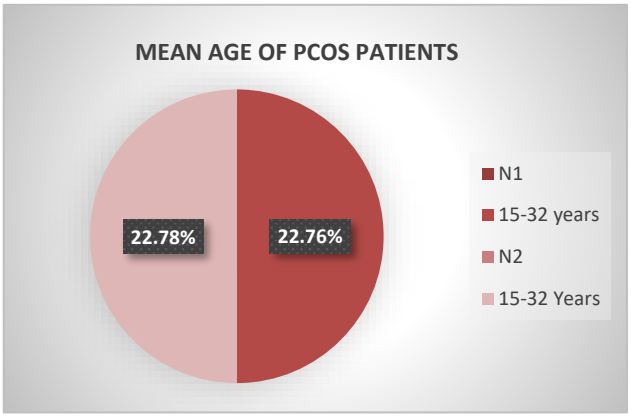

Figure 3: Mean age of PCOS patients.

Socio demographic profile

A total of 131 samples, N1 group with 63 samples and N2 group with 68 samples were used for this study. By doing independent sample t-test, the mean age for group 1, the mean age was 22.76±3.82 years, with ages ranging from 15 to 32 years. In group 2, the mean age was very similar at 22.78±3.79 years, also ranging from 15 to 32 years. The p value among two groups was 0.979, suggesting that they are age matched. This confirms age homogeneity between the groups, thus ruling out age as a potential confounder in intervention outcomes.

Table 1 gives the details about the demography variables from the study.

The education distribution among group 1 was 4.8% were illiterate, 6.3% had upper primary education, 39.7% completed high school, 28.6% higher secondary, 7.9% held a diploma, and 12.7% had an undergraduate degree. In group 2, 4.4% were illiterate, 7.4% had upper primary, 33.8% completed high school, 35.3% higher secondary, 4.4% held a diploma, and 14.7% had an undergraduate degree. The p value was 0.903, suggesting the there was no significant change in the distribution of educational status in both the group, ensuring similar levels of health literacy and receptiveness to intervention-related information.

The occupational status among two groups were categorized into employed, homemakers and students. Among which, group 1 has a percentage of 15.9% were employed, 65.1% were homemakers, and 19.0% were students. For group 2, 20.6% were employed, 70.6% were homemakers, and 8.8% were students respectively. There

is no significance in p value which was 0.220 suggesting the occupational status was matched in both the groups.

The lack of significant difference in socio-economic status suggests that both groups were socio-economically comparable at baseline. This is important because SES can significantly influence health behaviour, treatment adherence, dietary patterns, and access to healthcare services. The homogeneity of SES across groups helps eliminate it as a confounding factor, thereby strengthening the internal validity of the study and ensuring that any observed outcome differences can be more confidently attributed to the intervention rather than background socio-economic disparities.

The physical activity among two groups have been categorized in to mild, moderate and sedentary group. According to WHO, Mild activity includes two women who does daily activities which do not require much work, moderate work includes make your heart, lungs work more than mild activity. Sedentary workers are those who do not do any works even daily chores. The group 1 reported 44.4% patients with mild activity, 17.5% moderate, and 38.1%sedentary. Group 2 had 44.1% mild, 19.1% moderate, and 36.8% sedentary activity levels. This is important as physical activity is a key lifestyle factor in PCOD management; its equal distribution strengthens post-intervention comparisons.

Table 1: Demography variables.

Demography variables	N1 group	N2 group	Statistical test used	P value
Mean age	22.78%	22.76%	Independent sample t-test	t- 0.979
Education qualification				
Illiterate	4.8%	4.4%	χ^2 Chi square	0.903
Upper primary education	6.3%	7.4%		
High school	39.7%	33.8%		
Higher secondary	28.6%	35.3%		
Diploma	7.9%	4.4%		
Undergraduate degree	12.7%	14.7%		
Occupational status				
Employed	15.9%	20.6%	χ^2 Chi square	0.220
Homemakers	65.1%	70.6%		
Students	19.00%	8.8%		
Socio-economic status			Mann-Whitney U test	0.946
Physical activity				
Mild	44.4%	44.1%	Mann-Whitney U test	0.968
Moderate	17.5%	19.1%		
Sedentary	38.1%	36.8%		
Age of menarche				
11 years	36.5%	30.9%	Mann-Whitney U test	0.383
12 years	36.5%	29.4%		
13 years	19.0%	32.4%		
Number of children				
No children	67.4%	69.6%		
One child	25.6%	23.9%		
Two children	7.0%	6.5%		
Last child birth				
1 year ago	28.6%	28.6%	χ^2 Chi square	0.978
2 years ago	50%	57.1%		
3 years ago	7.1%	7.1%		
4 years ago	14.3%	7.1%		
Marital status				
Married	68.3%	67.6%	χ^2 Chi square	0.923
Unmarried	31.7%	32.40%		
Prior treatment taken				
Not relevant	67.4%	60.9%	χ^2 Chi square	0.258
Yes	23.3%	17.4%		
No	9.3%	21.7%		

Mann-Whitney U test was done to assess the difference in the age of menarche between group 1 and group 2. It was noted that there was no statistically significant difference in the age of menarche between the two groups (p>0.05). The median age of menarche was 12 years in both groups. In group 1, 36.5% had menarche at 11 years, 36.5% at 12 years, and 19.0% at 13 years. In group 2, 30.9% had menarche at 11 years, 29.4% at 12 years, and 32.4% at 13 years. This suggests similar reproductive maturity profiles across groups at onset of menstruation.

The marital status of two groups, with group 1 having 68.3% of women are being married and 31.7% unmarried. In group 2, 67.6% were married and 32.4% unmarried. The mean marital age group 1 is 20 years and group 2 with 21 years respectively with IQR of both groups (18-22 years). The median age at marriage was 20 years (IQR: 18-21) in group 1 and 19 years (IQR: 18-22.25) in group 2. Among these two groups, married participants who had no children were 67.4% in group 1 and 69.6% in group respectively. 25.6% and 23.9% had one child in group 1 and 2 respectively, and 7.0% in group 1 and 6.5% in group 2 had two children respectively. This is important because marital status can influence sexual activity, fertility intentions, and health behaviour. The treatment taken for PCOD by women was 23.3% in group 1 and 17.3% in group 2 respectively. Also, participants who did not take any prior treatment was 9.3% and 21.7% in group 1 and group 2 respectively. This similarity in treatment history suggests that prior exposure to PCOD interventions did not systematically differ, allowing a fair assessment of the new intervention's impact.

Across all key demographic parameters- age, education, occupation, activity levels, menarche, fertility status, marital status, and prior treatment- there were no statistically significant differences between the two groups. This demographic equivalence is critical as it validates the methodological integrity of the study, ensuring that any differences in physiological or endocrinal outcomes at follow-up can be attributed to the intervention itself (mindfulness of mooladhara chakra/ kayakalpa yoga and lifestyle practices), rather than pre-existing group differences.

Physiological parameters

Variable analyzed

BMI, blood pressure, waist hip ratio, hba1c, menstrual regularity, rate of ovulation, ovarian volume. All these variables have been analyzed before the start of study and after 1-year 1follow-up.

Interpretation of physiological parameters table

Table 2 assesses critical markers of metabolic, endocrine, and cardiovascular health in women with PCOD, comparing baseline and follow-up values for two treatment arms. The use of Mann-Whitney U test (non-parametric) reflects the nature of data distribution. The goal is to evaluate if the integrative intervention (group 2) showed superior physiological improvements over standard modern medical therapy (group 1).

Table 2: Physiological parameters.

Variables	Group 1		Group 2		Statistical test used	P value	
	Baseline	Follow up	Base line	Follow up		Day 1	After a year
BMI	27.8	27.9	28.1	27.3	U	0.928	0.491
Fasting blood glucose (FBS)	92	92	93	90			
Post-prandial blood glucose (PPBS)	132	134	133.5	131	U	0.775	0.095
HbA1c	5.5	5.6	5.55	5.5			
Waist-hip ratio	0.89	0.89	0.910	0.895	U	0.04	0.478
Systolic blood pressure	64.66	67.24	71.76	60.66	U	0.696	0.093
Diastolic blood pressure	64.23	67.6	71.86	60.5		0.606	0.087
Ovarian volume	44.8	48.62	45.4	41.6	U	0.853	0.201
Menstrual regularity after 1 year					Chi-square	<0.001	Significant
Rate of ovulation after 1 year					Chi-square	<0.001	Significant

According to WHO, BMI was calculated using the formula as weight in kilograms divided by the square of height in meters. BMI (median, kg/m^2) Among two groups, group 1 had a median BMI of 27.8 (IQR: 24.5-32.8) at baseline and 27.9 (IQR: 24.2-32.5) at follow-up which is intervention group. Group 2 had a median BMI of 28.1 (IQR: 24.6-32.9) at baseline and 27.35 (IQR: 24.0-31.7) at follow-up. While statistical significance was not achieved, the downward trend in BMI in group 2.

The fasting blood glucose of group 1 had 92 at baseline (IQR: 82-118) and 92 at follow-up (IQR: 84-110). Group 2 had 93 at baseline (IQR: 83.25-120) and 90 at follow-up (IQR: 82-98.75). After 2 hours, PPBS group 1 had 132 at baseline (IQR: 124-168) and 134 at follow-up (IQR: 126-153). Group 2 had 133.5 at baseline (IQR: 125.25-165.75) and 131 at follow-up (IQR: 122-141.5). The median value of HbA1C in group 1 was 5.5 at baseline (IQR: 5.2-6.6) and 5.6 at follow-up (IQR: 5.3-6.2). In

group 2, it was 5.55 at baseline (IQR: 5.2-6.6) and 5.5 at follow-up (IQR: 5.1-5.88). The p-value for insulin resistance at starting (day 1) was 0.775, whereas at the end of follow up 0.095 (p value >0.05), which doesn't show much significance. Not every PCOD patients had insulin resistance, but they had values just below the borderline, but in intervention group with help of yoga it was maintained even after 1 year.

Out of 11 adolescent age group girls, one was found to be pre-diabetic among group 1. In the age group of 20 to 22 years six were pre-diabetics and in women of 23 to 26 years 8 were found to be prediabetic. Among 27 to 29 age group, 3 were found to be pre-diabetic. Women who are equal and above 30 years women 2 were pre-diabetics. Pre-diabetes status in intervention group (group 2) in 24 years age group who we have as control group were 6 in number and all are married. Among them 2 were found to be prediabetic and 2 were hypertensive. Another 2 were same with pre diabetic and 2 were hypertensive.

PCOD is more linked with the obesity, mostly with central obesity. The waist-hip ratio for 2 groups was taken, waist circumference defined as measurement at the horizontal plane midway between the lowest ribs and the iliac crest. Hip circumference was measured at the level of the largest lateral extension of the hips. Waist-hip ratio (WHR) (day 1 and after 1 year). Median WHR for group 1 was 0.89 at both time points day 1 and after a year of follow-up. In group 2, median WHR was 0.91 at baseline and slightly decreased to 0.895 after one year. Though, p value was significant at day 1 which was 0.04, and followed with 1 year had a p value of 0.478 did not show much significance, but our study showed that patients who had been followed with help of yoga had a better result than patient who had been followed only with modern medicines with 0.910 in intervention group at day 1 and followed after 1 year with 0.895. The ovarian volume for the both groups, group 1 and group 2 has been calculated using USG report. Ovarian volume for group 1 during the 1st day was 12.7, and after 1 year of follow-up it was 12.6. Whereas, for the interventional group (group 2) day 1 it was 12.8, with yoga and other medications help it is 12.1. Though, p value was not significant, but the result showed better result than group 1 with help of yoga and medications.

Menstrual regularity and ovulation

Menstrual regularity and ovulation rate after 1 year

The outcomes assessed at the end of the 1-year intervention period showed that both menstrual regularity and rate of ovulation significantly improved in group 2 (modern medicine + yoga intervention) compared to group 1 (modern medicine only).

The Chi-square test yielded p values <0.001 for both parameters, indicating a highly statistically significant difference between the groups.

Ovarian volume

Group 1 showed a slight increase in ovarian volume, whereas group 2 exhibited a reduction. Although p values were not significant, this trend is clinically relevant, as a decrease in ovarian volume is associated with improved ovulatory function and reduction in follicular stasis- a hallmark of PCOD. The results suggest a positive impact of the intervention on ovarian morphology. Similar structural ultrasound findings were reported in a holistic intervention study combining yoga and naturopathy, where participants demonstrated measurable decreases in ovarian volume and follicle count alongside improved ovulatory markers.

Lifestyle parameters

Variable analyzed

Calorie intake, protein intake, micronutrient intake, physical activity, sleeping hours, food preferences veg or non-veg, type and amount of oil used, frequency of junk food intake, screen time per day and sleeping disturbances.

Table 3 explains about the life style parameters includes the calorie intake of both groups. In which, group 1 had a median calorie intake of 2800 kcal at baseline (day 1) (IQR: 2500-3200) and 2700 kcal at follow-up (after 1 year), (IQR: 2400-3200). In our study, both groups showed reductions in calorie intake, indicating general dietary adherence. However, since the changes were statistically non-significant, it suggests that caloric reduction alone may not explain differences in health outcomes, especially without qualitative changes in diet. It is recommended that women who are overweight lose 5-10% of their body weight in order to achieve a 30% energy deficit, or 500-750 kcal (1200-1500 kcal) per day.

Median protein intake by group 1 was 38 g at both time points (IQR: 36-40 and 38-40). Group 2 had a median calorie intake of 2850 kcal at baseline (IQR: 2500-3275) and 2700 kcal at follow-up (IQR: 2400-3075). Median protein intake was 38 g at baseline (IQR: 36.25-40) and 42 g at follow-up (IQR: 42-43.75). The protein intake by group 2 after a follow up shows a little bit rise in their health concerns.

This study showed that micronutrient intake has been in account of food preference, veg or non veg, amount of oil, type of oil used have been asked and advised for some changes in diet and followed up for a year. Both groups had universally inadequate micronutrient intake at baseline and after one year, with 100% of participants in both groups falling below recommended levels.

The majority of participants in both groups preferred non-vegetarian food. On day 1, 92.1% of group 1 and 92.6% of group 2 were non-vegetarians, with the remainder being vegetarian. After one year, these proportions

remained similar (92.1% group 1, 91.2% group 2), with a slight increase in vegetarians in group 2 (8.8%). Most of the non-vegetarians preferred poultry (96.6% group 1, 96.8% group 2), with a small minority preferring fish. After one year, poultry remained dominant in group 1 (94.8%), but in group 2, the preference for fish increased to 22.6%, with poultry at 77.4%. Also, we have analysed the frequency of non-veg intake, most participants consumed non-vegetarian food 2-3 times per week. Among group 1 participants 44.8% had twice a week, 25.9% had thrice a week; group 2: 47.6% had twice a week, 28.6% had thrice a week. After one year, group 1's frequency shifted slightly higher 32.8% once, 37.9% twice, 29.3% thrice respectively. While group 2 saw an increase in those not consuming non-veg at all 6.5% and a decrease in higher frequencies (p=0.006) (p<0.05).

Table 3: Lifestyle parameters.

Variables		Group 1		Group 2		Statistical test used	P value	
		Day 1	After 1 year	Day 1	After 1 year		Day 1	After a year
Calorie intake		2800 kcal 50%	2700 kcal 44.4%	2850 kcal 50%	2700 kcal 55.6%	U	0.679	0.743
Protein intake		48.1%	49.65	51.9%	50.4%	U	0.873	F- <0.001
Micronutrient intake		481%	51.9%	48.1%	51.9%			
Type of oil		85.7%	85.7%	86.8%	72.1%	χ^2 Chi square	0.985	0.021
Amount of oil used		60.7%	66.6%	70.8%	65.29%	U	0.125	0.824
Food preference non veg		96.6%	94.8%	96.8%	77.4%	χ^2 Chi square	1	0.006
Sleep 7-8 hours		55.6%	60.3%	66.2%	58.8%		0.799	0.398
Junk food	Monthly once	55.6%	21.4%	44.4%	78.6%	χ^2 Chi square	0.793	<0.001
	Monthly twice	42.2%	58.8%	57.8%	41.2%			
	Weekly once	46.3%	95.0%	53.7%	5.0%			
	Weekly twice	57.1%	100.0%	42.9%	0%			
Preference for non-veg	Fish	50%	17.6%	50%	82.4%	χ^2 Chi square	1	0.006
	Poultry	47.9%	53.4%	52.1%	46.6%			
Sleep disturbance		33.3%	33.3%	27.9%	2.9%	χ^2 Mecnmar's test	0.503	<0.001

The type of oil used by both groups have been recorded. Sunflower oil was the most commonly used oil in both groups at beginning of the study 85.7% in group 1, 86.8% in group 2. After one-year, sunflower oil remained predominant in group 1 85.7%, but in group 2 (intervention group), it has been decreased to 72.1%, with an increase in groundnut oil (22.1%) and the introduction of sesame oil (2.9%).

The Junk food consumption in both groups is being common as monthly and weekly consumption. After one year, group 1's pattern remained similar, while group 2 showed a notable increase in those reporting no junk food consumption 29.4% and a shift towards less frequent intake. The yoga intervention and consultation played a major role in the reduction in consumption of junk food along with medicines.

Most participants in the study have been for reported 7–8 hours of sleep per day. On day 1, 55.6% of group 1 and 66.2% of group 2 reported 8 hours. Group 2 had an increase in the sleep hours when compared to group 1. After one year, these figures were 60.3% (group 1) and 58.8% (group 2), with minor changes in distribution. The sleep disturbances have been noted by majority of participants, in group 1 at first it was reported by 33.3% of participants and 27.9% in group 2. After one year, the prevalence remained unchanged in group 1 which was 33.3%, but it had dropped sharply in group 2 to just 2.9%. The yoga and meditation together showed better result in group (p=0.001) (p<0.05).

This study included 63 patients in group 1 and group 2 consists of 68 patients, where the group 2 has been observed and analyzed with intervention of yoga.

DISCUSSION

Socio-demographic characteristics

The socio-demographic characteristics between the two groups were well-matched, with no significant differences in age, education, occupation, socioeconomic status, marital status, or age at menarche. This uniformity strengthens the validity of comparisons between the intervention and control groups.

Physiological parameters

PCOS can manifest during adolescence or reproductive age, and weight status during these periods may influence the severity of symptoms. Both normal-weight and overweight women are found in our study.

BMI

In our study, while statistical significance was not achieved, the downward trend in BMI in group 2 suggests a positive impact of the mindfulness with yogic-lifestyle intervention. This is consistent with evidence that structured physical and mindfulness practices can improve body composition even in the absence of drastic weight loss. Mohapatra et al in his study showed results obese PCOS patients have significantly higher measures of physical parameters like height, weight, waist circumference, hip circumference, waist-to-hip ratio, and neck circumference as compared to lean PCOS patients.[8] In our study Blood pressure increased slightly in group 1, it declined in group 2, approaching statistical significance. This pattern supports previous studies suggesting yoga and relaxation techniques improve autonomic balance, reduce sympathetic drive, and may help mitigate early hypertension risk in PCOD. A study by Vanitha et al demonstrated that a structured yoga nidra program significantly lowered both systolic and diastolic blood pressure in women with PCOS, highlighting the potential cardiovascular benefits of mind-body interventions in this population.[9]

In our study, the modest decrease in FBS in group 2, though not statistically significant, may be clinically meaningful, especially in the context of early insulin resistance reversal. The p value approaching significance at follow-up supports potential benefit of combining dietary discipline and stress-reducing practices. The post-prandial glucose levels improved marginally in group 2 and worsened slightly in group 1. This further supports the hypothesis that lifestyle modifications in group 2 had a stabilizing effect on glucose metabolism. Consistent with these observations, a pilot yoga intervention in women with PCOS reported a significant reduction in fasting blood sugar- from 95.7 to 91.8 mg/dl (p=0.007)- further highlighting the potential of integrated dietary and stress management strategies in improving glycemic control.[10]

Insulin resistance

In our study, Insulin resistance did not show much significance, but mild differences and reduction have been noted in participants at intervention group. Both groups carried the HbA1c value of 5.5 mg/dl on average. The intervention group (group 2) demonstrated a modest decrease in median BMI and fasting blood glucose levels after one year, whereas the control group's values remained mostly unchanged or slightly worsened. Despite a marginal rise in group 1, group 2 exhibited a reduction, indicating better glycemic control. Though small, this improvement over 12 months aligns with findings that even minimal lifestyle changes can reduce chronic glycemic load in PCOS patients. Raho et al in his study shows that, women with PCOS, changes in attitude, environment, and nutrition can also have a negative impact on insulin sensitivity.[11]

Waist-hip ratio

Importantly, our study showed, waist-hip ratio showed a significant difference at baseline but not after one year, indicating potential convergence in central adiposity measures due to intervention. A significant difference existed at baseline, with group 2 showing higher central obesity. However, over one year, group 2 demonstrated improvement, while group 1 remained unchanged. Although final p value was non-significant, the trend suggests that the intervention may reduce central fat distribution- a critical factor in PCOD risk modulation. Mirjana et al in his study was unable to show a difference in WHR between PCOS and healthy women in their article, but their results confirmed a significant influence of android obesity towards insulin resistance in both PCOS and controls, indicating that PCOS women are more susceptible to increasing WHR regarding the development of insulin resistance. Clinically, these confirmed as increased WHR, android obesity is a particularly strong risk for insulin resistance and other factors that predispose to premature cardiovascular disease.[12]

Menstrual regularity and ovulation rate

These findings provide robust evidence that the integrated intervention had a strong positive effect on reproductive outcomes in women with PCOD. Restoration of menstrual regularity and ovulation are primary therapeutic goals in PCOD management, directly impacting fertility and hormonal balance. The statistically significant improvement in group 2 emphasizes the efficacy of combining modern pharmacological treatment with lifestyle and mindfulness cum yogic practices. These non-pharmacologic interventions likely worked by reducing stress, modulating the HPO (hypothalamic-pituitary-ovarian) axis, and improving metabolic homeostasis- all of which are critical for reestablishing normal menstrual and ovulatory patterns.[13]

Although most p values did not reach statistical significance- likely due to sample size constraints or physiological variability- the directional trends in group 2 consistently favoured improvement in: glycemic control (FBS, HbA1c, PPBS), central obesity (WHR), blood pressure, ovarian volume.

These findings collectively suggest that the integrated intervention (modern medicine + traditional yoga and dietary practices) may offer multidimensional benefits in managing PCOD symptoms beyond what is achieved with pharmacotherapy alone. The intervention potentially modulates metabolic, endocrine, and reproductive dysfunctions by addressing both physiological and psychosomatic components of the disorder.

Interpretation of lifestyle parameters table

This section assessed the role of dietary habits, sleep patterns, and behavioural practices in PCOD

management. The data reflects changes in calorie intake, macronutrient/micronutrient patterns, food preferences, oil usage, and sleep- important modifiable lifestyle factors known to influence metabolic and hormonal outcomes in PCOD.

The study found several significant improvements in lifestyle factors in the intervention group (group2).

Protein intake

In our study, at follow-up, a statistically significant improvement in protein intake in group 2 suggests greater dietary quality improvement- possibly due to better nutritional education and adherence. Protein intake has improved significantly in group 2, while remaining unchanged in group 1. Higher protein diets are linked to improved insulin sensitivity and satiety, both crucial for PCOD management. Wang et al, in his study showed that is no known ideal diet for people with polycystic ovarian syndrome (PCOS). Although there are currently no studies on the impact of high-protein diets (HPDs) on PCOS, they are beneficial in helping people with metabolic disorders regulate their weight. Weight loss, abdominal adiposity, lipid profiles, and reproductive hormones were all affected similarly by HPDs and BDs (all $p>0.05$). Although more RCTs in larger and more comprehensive settings are needed to validate these observations and look into the mechanism underlying them, high protein diets may help women with PCOS by decreasing insulin resistance, supporting their usage as one of the dietary management choices for PCOS.[14]

Micronutrients

Despite interventions, micronutrient deficiencies persisted. This aligns with prior evidence that macronutrient-focused dietary improvements are more achievable in the short term, while micronutrient correction requires targeted supplementation or highly tailored diets. how supplementation of different vitamins, minerals, and other supplements contribute to prevent complications of PCOS.[15]

Sleep disturbances

Our study when analysed for sleep disturbances which showed a significant decrease drastically in the intervention group (from 27.9% to 2.9%), a statistically significant change, suggesting the mindfulness and yoga practices may enhance sleep quality which is a known concern in PCOD. Although the number of participants sleeping 7-8 hours didn't change significantly, the quality of sleep may have improved, especially in group 2- as seen below. This dramatic reduction in sleep disturbance in group 2 is one of the most significant outcomes of the intervention. Yoga and mindfulness have established benefits on autonomic regulation, stress reduction, and sleep quality- all of which directly affect hormonal balance in PCOD. Ferendaez et al; among them, in the PCOS women's group, 37.6% experienced restless sleep, 43.9% suffered from difficulty sleeping, 56.9% felt severe tiredness, and 47.7% reported difficulty in falling asleep.[16]

Junk food consumption

In our study, junk food consumption and screen time both significantly reduced in group 2, pointing to broader behavioural improvements potentially induced by regular mindful practice. However, group 1 did not show much improvement. The intervention led to a substantial and statistically significant reduction in junk food consumption in group 2. This change reflects successful behavioural and dietary discipline, likely facilitated by continuous reinforcement, mindfulness, and dietary guidance. The results of Radwan et al point to a strong correlation between the target population's prevalence of PCOS and junk food consumption. Numerous factors that are known to contribute to the development of PCOS, such as hormone imbalances, insulin resistance, medication use, and inflammation, can be blamed for this relationship. This result is in line with a study by Hajivandi et al that found that teenage females with PCOS frequently eat junk food, soft drinks, fast food, and sweets.[17,18]

Oil preferences

In our study it showed that there was a shift in oil preferences from sunflower oil to healthier alternatives like groundnut and sesame oil in group 2, and a significant reduction in oil quantity consumed. The shift in oil usage in group 2 reflects behavioural modification prompted by intervention. A move away from sunflower oil may indicate a preference for healthier alternatives (e.g., groundnut/sesame oil), positively impacting lipid metabolism. Although oil types shifted, overall quantity of oil used remained high, indicating a need for deeper dietary counselling on fat moderation.

In their intervention trial, Yahay et al evaluated canola, sunflower, and olive oils and found that oil consumption dramatically reduced the effects of PCOS. Olive oil ($p=0.005$) and canola oil ($p<0.001$) may both considerably lower the fatty liver grade. Additionally, there was a substantial decrease in HOMA-IR in both the olive ($p=0.004$) and canola ($p<0.001$) groups. After consuming canola oil, women with PCOS showed notable changes in their lipid profiles, liver function, and HOMA-IR when compared to olive and sunflower oils.[19]

Also, there was significant change was seen in the preference for non-vegetarian food in group 2, with a slight shift towards fish (perceived as healthier), which may reflect a broader health-conscious lifestyle shift. A significant reduction in non-vegetarian intake among group 2 may be linked to health consciousness and spiritual influences from yoga practice. Reduced animal protein intake may also relate to a drop in saturated fat

consumption and better glycemic control. Fish-based diets, typically richer in omega-3s, are associated with better inflammatory profiles. The dietary pattern shift toward fish in group 2 likely reflects health-directed decision-making influenced by intervention. The lifestyle intervention in group 2 demonstrated statistically and clinically meaningful improvements in dietary habits (less junk food, healthier protein choices, improved oil type), as well as dramatic enhancement in sleep quality. These findings validate the role of yogic and holistic practices as effective adjuncts to modern pharmacotherapy in the long-term management of PCOD, targeting both physiological and behavioural components of the disorder.

Anxiety and stress

Despite the fact that a great deal of research has been done in this field, it is still unknown what factors affect the degrees of anxiety and depression in women with PCOS. Additionally, in our study, anxiety and stress levels, evaluated through psychological assessments, showed significant reductions in both groups, but more pronouncedly in group 2. These findings underscore the psychological benefits of integrating traditional yogic and mindfulness practices in PCOD care. In his study, Dybciak et al demonstrated that significant levels of anxiety were supported by our findings; only 25% of the women with PCOS who were tested had no anxiety, while 74.4% of them experienced mild (28%), moderate (26%), and severe (20%) anxiety symptoms. Just 4.5% of the control group reported having significant anxiety, while more than 60% of them acknowledged having no anxiety. Just 6% of the women with PCOS in a recent study experienced severe anxiety symptoms; the remaining women had mild to moderate symptoms.[20]

A major strength of this study is its interventional design and one-year follow-up, allowing sufficient time to observe longitudinal changes. The integration of both physiological and behavioural/lifestyle factors provides a comprehensive picture of patient outcomes.

The limitations of the study include the reliance on self-reported data for some lifestyle factors (e.g., diet, sleep, screen time), which may be subject to reporting bias. Additionally, some outcome measures lacked statistical output (e.g., menstrual regularity, ovulation rates), which weakens the strength of inferences about reproductive health improvements.

The findings suggest that integrating ancient Indian traditional practices such as mindfulness of the Mooladhara chakra and Kayakalpa yoga with standard medical treatment could offer modest but more sustainable improvements in metabolic, lifestyle, and psychological health in women with PCOD. While not a replacement for pharmacological intervention, these practices could serve as beneficial adjunct therapies.

CONCLUSION

This study highlights the potential of combining modern medicine with traditional Indian wellness practices in the management of PCOD. The observed improvements in stress, sleep, dietary habits, and metabolic markers point to the holistic benefits of such integrative approaches. Future studies with larger sample sizes, detailed reproductive outcome data, and randomized designs are warranted to confirm and expand on these findings. Thus, more research with larger sample size needs to be done to find the clear-cut association between the lifestyle parameters and physiological parameters and PCOS.

ACKNOWLEDGEMENTS

The author thanks all participants for their participation and cooperation. Special thanks to my guide.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kasthuri A, Mahindra J, Bedi M, Jayashree S, Kamali, Krishnan KM. Impact of traditional Indian practices combined with modern medicine on physiological and lifestyle parameters in reproductive-age women with polycystic ovarian disease: a comparative interventional study. Int J Community Med Public Health 2026;13:3815-26.