

Effect of yoga on female hormones in peri-menopausal women

Rita Khadka,¹ Bishnu Hari Paudel,¹ Madhab Lamsal,² Nikesh Shrestha,³ Mohan Chandra Regmi,⁴
Sailaja Chhetri,⁴ Prahlad Karki³

Author(s) info :

¹Department of Basic and Clinical Physiology, BP Koirala Institute of Health Sciences

²Department of Biochemistry, BP Koirala Institute of Health Sciences

³Department of Internal Medicine, BP Koirala Institute of Health Sciences

⁴Department of Obstetrics and Gynecology, BP Koirala Institute of Health Sciences

Correspondence :

Dr Rita Khadka

Additional Professor

Department of Basic and Clinical Physiology, BP Koirala Institute of Health Sciences, Dharan, Sunsari, Nepal

Email:

rita.khadka@gmail.com

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ABSTRACT

Background : One of risk factors for increased rate of cardiovascular diseases and development of menopausal symptoms in perimenopausal/postmenopausal women is reduced estrogen production. Yoga practice improved menopausal symptoms in postmenopausal women. Whether yoga practice had effect on estrogen in perimenopausal/postmenopausal women was not known. Thus, this study was conducted to assess the effect of yoga on female hormones; estrogen, progesterone, luteinizing hormone (LH), and follicular stimulating hormone (FSH) in perimenopausal women.

Methods : The study included 60 perimenopausal women, grouped into yoga (n=30, age 44±2.64 years) and control (n=30, age 46±5.09 years) groups. The yoga group practiced meditation, pranayama and few simple asanas for 40 min/day, 6 days/week for 4 weeks. The control group did not practice any kinds of exercise. Levels of female hormones were assessed in all subjects at the beginning of the study and after four weeks of the study, and compared statistically. Institutional Ethical Committee approved the study.

Results : Age, body mass index (BMI), blood pressure (BP), Heart rate (HR), and respiratory rate were comparable between the groups at the beginning of the study. Hormones LH and FSH showed no significant changes within and between group comparisons. Serum estrogen [11.95 (5.05-41.32) vs 24.47 (12.54-64.90) pg/ml, p=0.036] and progesterone [0.24 (0.10-1.02) vs 2.0 (0.25-9.73) ng/ml, p=0.012] increased in yoga group after yoga practice in within group comparisons, whereas, the control group showed no changes.

Conclusion : Estrogen and progesterone levels increased in perimenopausal women after four weeks of yoga practice, whereas, LH and FSH showed no changes. It reveals that yoga practice can have cardio protective effects in perimenopausal women.

Keywords: perimenopause, heart rate variability, estrogen, progesterone, yoga

INTRODUCTION

Perimenopause is a phase of transition in woman's reproductive life. It begins with less production of estrogen from ovaries at the age of 40 years and onwards.¹ During this phase, women start experiencing several perimenopausal symptoms like hot flashes, mood swing, irregular menses, and palpitations. The average length of perimenopause is four years, but in some women this stage may last only for a few months, whereas in some women it may continue for 10 years or even more. Perimenopause ends after first year of cessation of menses.²

The cardiovascular diseases are reported in peri- and postmenopausal women^{3,4}. Rate of death with cardiovascular diseases (CVD) was found higher in women in this phase of life than men.⁵ A number of studies have reported that women between age 40-49 i.e. at the time of the menopause transition or perimenopausal period, had significantly greater risk of mortality.^{6,7} Peri-menopausal/postmenopausal women had generally higher lipid level.^{3,4,8} It is suggested that the ovarian function i.e. reduced production of estrogen might be one of the causative factors for the development of cardiovascular diseases in this period of life in female.⁶ Estrogen has effect on lipid metabolism and neuro-hormonal release.⁹ Thus, production of estrogen during early phase of reproductive life might be reducing the development of atherosclerosis and body fat, and helpful in reducing the risk of cardio-vascular diseases in premenopausal women. Perimenopausal women with serious symptoms are treated with estrogen therapy (ET). The ET is said to have cardio-protective effects and studies have recommended ET to reduce the risk of cardiovascular diseases in peri-menopausal/postmenopausal women.^{6,10} However, estrogen has disadvantageous effects i.e. proliferative effects on breast and long-term use can cause breast cancer.⁶ It is increasingly recognized that hormone therapy is inappropriate for older post-menopausal women.⁶ Therefore, there is a need for exploring some alternative therapy that can improve the condition of peri-menopausal women and can act as a cardio-protective measure.

Yogic intervention is known to act as an adjuvant therapy in several stress related diseases^{11,12}. It has a definite role in the management of hypertension¹³⁻¹⁵ and diabetes mellitus.^{13,16} Both hypertension and diabetes mellitus are reported as the important

risk factors for the development of cardiovascular diseases in peri-menopausal/postmenopausal women.⁶ Yogic exercises are also reported to decrease LDL-cholesterol¹⁷ and increase HDL-cholesterol,¹⁸ which lower the risk of cardiovascular diseases. Yoga practice improved menopausal symptoms in postmenopausal women^{19,20} How yoga practice could improve menopausal symptoms? Whether yoga had effect on female hormones in perimenopausal/postmenopausal women was not known. Therefore, we aimed to study the effect of combined yoga practice on female hormones; estrogen, progesterone, luteinizing hormone (LH), and follicular stimulating hormone (FSH) in perimenopausal women.

MATERIALS AND METHODS

This is the part of a study in which effect of yoga was assessed on heart rate variability, lipid profile and other biochemical parameters, and female hormones in perimenopausal women. The part; effect of yoga on heart rate variability, lipid profile, and other biochemical parameters has been already published.²¹ The effects of yoga on female hormones are included in this study.

Sixty women between age 42-52 years with irregular periods and one or more than one of the major symptoms of perimenopause like hot flashes, mood swing, palpitation, and sleep disturbance were included in the study. All the subjects were recruited from the department of Obstetrics and Gynecology, BP Koirala Institute of Health Sciences (BPKIHS) after clinical examination. Institutional Ethical Review Board, BPKIHS approved the study. All subjects gave informed written consent before start of the study.

A standardized proforma was used to record clinical sign and symptoms, past history, family history, medication (if any) and demographic data of all women. Patients with frequent ventricular ectopics and arrhythmia, diseases like diabetes mellitus, renal failure, severe physical and mental disorders, severe hypertension (SBP >160 & DBP >100, according to JNC-7, 2003 guidelines),²² patients on estrogen or progesterone therapy, patients previously engaged in any kind of relaxation therapy or other exercises, smokers and alcoholics were excluded from the study.

All subjects were grouped into control (n=30) and yoga (n=30) groups using computer based random

number table method. In both the groups, two recordings were taken; first recording (baseline recording) at the beginning of the study (visit 1) and second recording after four weeks of the study (visit 2). During the four weeks of period, the control group led their usual life. They did not practice any kind of exercise. The yoga group practiced combined yoga practice (given below) for four weeks about 40 min/day and 6 days/week. They learnt yoga practice properly at Yoga and Lifestyle Clinic, BPKIHS, Dharan for one week. After they learnt yoga practice properly, they continued it at home. Yoga practice related protocol was given to all subjects of yoga group and they were regularly followed up for their practices. They were asked to maintain a diary for it.

The blood sample was collected from the antecubital vein in the fasting state between 8:30 and 9:30 AM for estimation of female hormones. The collected blood samples were allowed to clot and serum was separated after centrifugation at 3000 RPM. The serum of blood samples was stored at minus 20 degree. The estimation of female hormones; estrogen, progesterone, LH, and FSH was done by ELISA method in the Department of Biochemistry, BPKIHS using an ELISA reader (HumanReader HS, Wiesbaden, Germany) and standard protocol. All the recorded data were analyzed and compared between the groups using statistical tools.

Yoga practices consisted of¹⁵

- Warming-up exercises (for 5 min): Consisted of Manibadha Vikash, Shakti Vikash, Ardhabhuj Shakti Vikash, Purnabhuj Shakti Vikash, Anjali Shakti Vikash, Kamar Chakrasana,

Vakshasthal Shakti Vikash and Uder Shakti Vikash. Each exercise for 2 to 3 times.

- Yogic asanas (for 6-7 min): Consisted of Tarasana, Trikonasana, Gomukhasana, Shashankasana, Padmasana, Bhujangasana, Hradhayastambhasana, Naukasana, and Makarsana. Each for 2 to 3 times.
- Shavasana, for 5 min.
- Meditation in a comfortable posture for 5 min.
- Pranayama: Same nostril breathing and alternate nostril breathing, each for 2 min.

Statistical Analysis: The data was analyzed using software SPSS 11.5. Anthropometric and cardio-respiratory variables were normally distributed. Thus, data were compared within the groups using paired t test and between the groups using unpaired t test. Data are expressed as mean±SD. Levels of female hormones were non-normally distributed. Thus, data were compared within the group using Wilcoxon-sign test and between the groups using Mann-Whitney U test; and the data are expressed as median (inter-quartile range). The $p < 0.05$ was considered statistically significant.

RESULTS

Comparison of anthropometric and cardio-respiratory variables within and between the yoga and the control groups

Both the groups were comparable for their age, body mass index (BMI), systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate

Table 1. Comparison of anthropometric and cardio-respiratory parameters within and between the groups

Parameters	Yoga group (n=30, mean±SD)			Control group (n=30, mean±SD)		
	Within group comparison			Within group comparison		
	Visit 1	Visit 2	p value	Visit 1	Visit 2	p value
Age, years	46±4.9	-	-	44.8±4.21	-	-
BMI, Kg/m ²	24.49±4.9	22.18±2.4	0.021*	25.20±6.21	24.98±4.21	0.393
SBP, mmHg	121±5.0	110±12.0	0.019	121.0±11.0	121.3±10.0	0.893
DBP, mmHg	74.8±7.7	73.9±7.2	0.073*	72.9±7.9	76.8±10.0	0.079
HR, bpm	78.8±7.7	71.4±5.7	0.032*	78.2±8.0	77.4±9.0	0.745
RR, breaths/min	17.6±2.4	16.4±2.4	0.063	16.6±2.3	16.9±2.1	0.543

Table 2. Comparison of female hormones within and between the groups

Hormones	Yoga group (n=30, Median (q1-q3))			Control group (n=30, Median (q1-q3))		
	Within group comparison			Within group comparison		
	Visit 1	Visit 2	p value	Visit 1	Visit 2	p value
Estrogens, pg/ml	11.95 (5.05-41.32)	24.47 (12.54-64.09)	0.036	12.07 (10.14-15.94)	16.54 (9.04-19.31)	0.214
Progesterone, ng/ml	0.24 (0-1.02)	2.0 (0.25-9.73)	0.012	0.08 (0.06-0.20)	0.56 (0.13-0.69)	0.061
Luteinizing hormone, mIU/ml	7.62 (2.7-12.78)	4.74 (3.01-11.77)	0.798	17.65 (2.59-24.61)	13.47 (2.98-22.64)	0.767
Follicular stimulating hormone, mIU/ml	12.6 (8.58-65.88)	11.01 (10.01-41.02)	0.401	26.15 (11.79-66.01)	56.54 (8.66-74.36)	0.441

(HR), and respiratory rate (RR) in visit 1 (at the beginning of the study). In visit 2 (after one month of the study), the yoga group showed significant decrease in BMI, DBP and HR as compared to the control group (Table 1).

In within group comparison, the control group did not show any differences in any of the anthropometric and cardio-respiratory variables, whereas, the yoga group showed significant decrease in BMI, SBP and HR as compared to the control group (Table 1).

Comparison of level of female hormones within and between the yoga and the control groups

Level of all four female hormones; estrogen, progesterone, LH, and FSH were comparable between the groups at the beginning of the study, visit 1 (Table 2). In visit 2, no changes were found in any of the female hormones between the groups. In within group comparison, the control group showed no significant changes in any of the hormones, whereas, the yoga group showed significant increase in the level of estrogen and progesterone hormones after four weeks of yoga practice (Table 2). Both LH and FSH hormones were found decreased in yoga group in visit 2, however, it was not statistically significant.

DISCUSSION

The study assessed the effect of yoga on female hormones; estrogen, progesterone, LH, and FSH in

peri-menopausal women, not suffering from any diseases, and not on any medication. They were randomized into yoga and control groups. The yoga group practiced combined yoga (meditation, asanas, pranayama, relaxation practice) for 40 min/day for four weeks. The control group did not practice any exercise.

Both the groups were comparable for their age, BMI, resting HR and resting BP. After one month of the study, the control group showed no changes in any of the parameters in within group comparison, whereas, the yoga group showed significant reduction in BMI, SBP, and HR in within group and BMI, DBP, and HR between the group comparisons. Yoga practice was found effective in reducing SBP, DBP, and HR in hypertensive patients.¹³⁻¹⁵

There are studies^{23,24} which showed that simple yogic asana and pranayama decreased BMI, total cholesterol, triglycerides in obese individuals. We found decrease in BMI after yoga practice in essential hypertensive patients¹⁵ and in perimenopausal women.²¹ We also found a decrease in total cholesterol, LDL cholesterol and triglycerides, and an increase in HDL cholesterol after yoga practice in perimenopausal women.²¹ It suggests that yoga is effective in reducing BMI and lipid profile in perimenopausal condition also, in which there is a definite decrease in production of estrogens. It is well known that estrogens have effect on lipid metabolism⁹ and decrease the lipid levels during reproductive ages of females.

Interestingly, the present study showed significantly increased estrogen and progesterone levels in perimenopausal women after 4 weeks of yoga practice. The increase in levels of estrogen and progesterone might have improved the lipid metabolism causing reduction in BMI, SBP, DBP, and HR in perimenopausal women in the present study.

The query was how yoga practice increased estrogen and progesterone levels. Several published studies showed that yoga practice influenced endocrine functions.²⁵⁻²⁷ Eight weeks of yoga training showed an increase in adrenocorticotropic hormone (ACTH) in female patients with multiple sclerosis.²⁵ Glaser et al.²⁶ found elevated dehydroepiandrosterone sulfate (DHEAS) in female transcendental meditation practitioner by 28% in the age group 40–44-year; 34% in the 45–49-year; and 54% in the 50–54-year. Elevation in DHEAS might be due to increased secretion of ACTH after yoga practice because synthesis and secretion of the DHEA and DHEAS are regulated by pituitary ACTH. A 12-week of combined yoga practice (Asanas, surya namaskar, meditation and pranayama) increased growth hormone level.²⁷ It reveals that yoga practice influences hypothalamus and pituitary gland. It is supported by a traditional Chinese meditation study. The study showed positive activation in pineal gland and the hypothalamus during the first and second stages of meditation on fMRI.²⁸ The DHEA has been reported in a review to increase estrogen production in adipose tissue, skin, and adrenal medulla locally or intracrinologically.²⁹ It was found that locally produced estrogen normally did not increase circulatory levels of estrogen.³⁰

In the present study perimenopausal women practiced meditation along with easy asanas, pranayama, and relaxation practice; and the age group was 42-52 years. Possibly in the present study ACTH and DHEAS might have increased and that increased estrogen production locally. However, it may not be only mechanism for the increase in estrogen in the present study. Locally produced estrogen does not increase circulatory levels of estrogen.³⁰ In the present study both estrogen and progesterone hormones increased in the blood after 4 weeks of combined yoga practice. Levels of LH and FSH were also assessed in the present study. Both LH and FSH showed a decreasing trend but not statistically significant. It seems that the present set of yoga practice stimulated ovarian follicular cells in perimenopausal women

for the production of estrogen and progesterone and a trend of feedback inhibition of LH and FSH (but not statistically significant). It reflects the involvement of hypothalamic-pituitary-gonadal axis. It needs further studies for exploring the underlying mechanisms.

CONCLUSION

In perimenopausal women, four weeks of combined yoga practice (meditation, pranayama, easy asanas, and relaxation practice) decreased BMI, SBP, HR, and increased levels of estrogen, and progesterone, and a decreasing trend in LH and FSH hormones. The results suggest that combined practice of yoga even for 4 weeks is effective in increasing estrogen and progesterone levels in perimenopausal women. We also found increase in cardiac parasympathetic activity and HDL cholesterol, and decrease in total and LDL cholesterol with the same set of yoga practice²² in perimenopausal women. Thus, results strongly suggest that combined yoga practice can reduce cardiovascular risk factors in perimenopausal women.

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CONFLICT OF INTEREST

None.

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