

# Effect of yoga on pulse rate and blood pressure among women

G. Kaleeswari, C. Vasantha Kalyani, J. S. Jayarani, Kusum K. Rohilla

College of Nursing, All India Institute Medical Science, Rishikesh, Uttarakhand, India

## ABSTRACT

**Objectives:** Change in the past few decades in human life style, nowadays international health organizations, i.e., World Health Organization are also focusing on prevention along with treatment aspect of chronic illness. Researches focus that women of age group 30–45 years are at increased risk for hypertension and heart disease due to increased weight. Yoga is an effective method to control our physiological variables like blood pressure (BP), pulse, etc. The main aim of this study was to identify the effects of yoga on physiological variables. **Methods:** The study was an experimental study with two group, pretest and posttest control group, design, which was conducted on 40 female participants. Pranayama and meditation for a period of 6 weeks was done by these women. **Results:** Yoga therapy significantly reduced the BP (0.000\*) and pulse rate (0.000\*) of women, which was also statistically proved. **Conclusions:** Yoga therapy can be an effective method to control BP and pulse rate of patients with chronic diseases.

**Keywords:** Blood pressure, physiological variables, pulse rate, yoga therapy

## Introduction

World Health Organization reported that in developing countries death rate is higher due to chronic diseases<sup>[1]</sup> like hypertension, diabetes, etc. The main root causes for all chronic diseases are either increased blood pressure (BP) or increased weight.<sup>[2]</sup> Research reported that globally, in 2016, about 39% of people over 18 years are overweight<sup>[3]</sup> and 13% already in obese category. Overweight/obesity are the fifth risk factor which may also lead to death also. About 2.8 million people annually die because of obesity globally. So, overweight or obese is a global epidemic.<sup>[4]</sup>

National Family Health Survey (NFHS) report 2005–2006 revealed that overweight or obesity was significantly noted in urban communities. The report also revealed that it's highly prevalence is higher in middle aged women especially.<sup>[5]</sup> Various researches

reported reasons for its high prevalence of overweight/obesity among middle aged women. Research reported that main cause of overweight/obesity were reduced basal metabolic rate<sup>[6]</sup> due to decreased physical activity.<sup>[7]</sup> Another study reported that due to decreased production of growth hormones and estrogen lead to obesity.<sup>[8]</sup> Another study identified that overeating is a reasons for overweight and obesity.<sup>[9]</sup> Due to lack of physical activity, which may lead to obesity or other associated comorbidity like hypertension. It is observed that body mass index (BMI) is comparatively high among pre-hypertensive and hypertensive groups, which shows its significant correlation.<sup>[10,11]</sup>

Studies have found that obesity leads to arterial stiffness due to changes in the vascular structure.<sup>[12]</sup> Obesity reduces vascular elasticity due to changes in endothelial function which may lead to increased BP.<sup>[13]</sup> The reasons will be due to increased arterial intima layer thickness and, hence, it reduces arterial lumen diameter.<sup>[14]</sup> This arterial stiffness increases systolic blood pressure (SBP) and simultaneously decreases diastolic blood pressure (DBP).<sup>[15]</sup> This further increases pulse pressure, which increases the load on left ventricle, results in increased

**Address for correspondence:** Dr. Kusum K. Rohilla, Nursing College, All India Institute Medical Sciences, Rishikesh - 249 203, Uttarakhand, India.  
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risk of myocardial infarction and other coronary heart disease. So, obesity changes both physiological variables, i.e., BP and pulse rate.

Yoga is a mind and body technique which is a combination of physical exercises (Asanas) in synchronous with breathing techniques like pranayama and meditation. It provides us with various beneficial effects.<sup>[16]</sup> Yoga also improves lipid profile, heart rate variability<sup>[17]</sup> and decrease in BP.<sup>[18]</sup> The aim of our study was to identify effectiveness of yoga therapy of physiological variables among women.

## Methods

The study was conducted at All India Institute of Medical Sciences, Rishikesh, India. Total 46 women of age group range from 30 to 45 years were recruited for this study. A total of 50 women were screened; out of whom four declined to sign informed consent form. Remaining 46 were registered for the trial and were randomly allocated in both groups. Figure 1 depicts a flow diagram of the study, enrollment and intervention.

Inclusion criteria for study were: women of age group 30–45 years; normal BP; diagnosed with any chronic illness and taking any treatment; physical activity not contraindicated; physical and cognitive impairment; able to perform yoga and willing to participate in study. Exclusion criteria for study were: prior experience of yoga, hospitalized within 3 months.

Single-blind randomized control trial with 46 participants was divided in two groups (yoga versus control) using a computer-generated random software, i.e., sealed envelope.<sup>[19]</sup> Opaque envelopes were used to do random allocation of participants in each group.

Specialist physician did complete systemic examination of each participants at enrollment of study. Each participant did practice set of integrated for yoga for 45 mint, 5 days/week for 6 weeks with postgraduate diploma in yoga with 10 years of experiences. Participants of control group did conventional therapy. Pre yoga and post yoga therapy assessments, i.e., BP and heart rate was done in both groups equally after 6 weeks of intervention. All participants refrain from participating in other type of yoga-related activity during this study period.

## Blinding

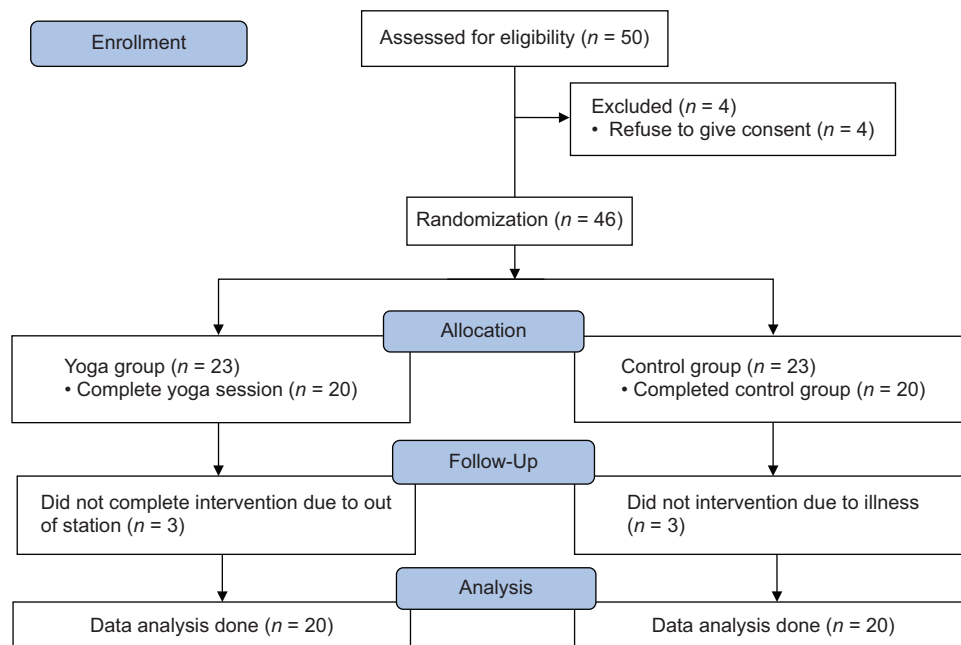
Double blinding was not possible for yoga interventions, in this participants and trainer can identify both assigned group.

## Intervention

Yoga sets of integrated modules were developed and validated by five experts in the field of yoga. It mainly consist of simple practices which work on physical, mental and emotional health. Yoga training session details depicted in Tables 1-3.

## Data collection procedure

Pre and post assessment of subjects after 6 weeks was done after relaxation for 20 min. BP was measured using a calibrated and validated android sphygmomanometer device. Both SBP and DBP recordings were taken with back support, legs uncrossed and upper arms bared from the left hand to maintain consistency in sitting position. All clothing covering the cuff region was removed, cuff bladder was ensured encircling 80% or more of the participants arm circumference. Participants were instructed not to talk while taking measurements. Pulse rates were measured by sitting each participant comfortably and measured using a digital



**Figure 1:** Consort Diagram

**Table 1: Yogic training schedule for 0-2 weeks**

Yogic training	Duration	Repetition	Sets	Rest between practices	Rest between Sets	Frequency/week
Sitilikarana Vyayama (loosening exercises)	5 min	2	2	5-10 s		
Surya Namaskar	6 min	2	2	10-15 s	5-6 min	5 days/week
Padmasana	3 min	2	2	5-10 s		
Ardha Katichakarasana	3 min	2	2	5-10 s		
Vipareeta karani	3 min	2	2	5-10 s		
Bhujangasana	3 min	2	2	5-10 s		
Padahastasana	3 min	2	2	5-10 s		
Savasana	6 min	1	1	5-10 s		
Chandra and Surya anuloma and viloma	3 min	2	1	5-10 s		
Nadishodana Pranayama	3 min	2	1	5-10 s		
Bhramari and Bhastrika Pranayama	3 min	2	1	5-10 s		
Japa Meditation	5 min	1	1	-		

**Table 2: Yoga training schedule for 2-4 weeks**

Yogic training	Duration	Repetition	Sets	Rest between practices	Rest between sets	Frequency/week
Sitilikarana Vyayama (loosening exercises)	4 min	3	2	5-8 s		
Surya Namaskar	6 min	3	2	5-10 s	5-6 min	5 days/week
Vajrasana	3 min	3	2	5-8 s		
Ustrasana	3 min	3	2	5-8 s		
Padahastasana	3 min	3	2	5-8 s		
Sasangasana	3 min	3	2	5-8 s		
Halasana	3 min	3	2	5-8 s		
Dhanurasana	3 min	3	1	5-8 s		
Savasana	6 min	1	-	-		
Nadi Sodhana Pranayama	3 min	3	1	5-8 s		
Sheetali and Seetkari Pranayama	3 min	3	1	5-8 s		
Japa Meditation	5 min	1	1	-		

**Table 3: Yoga training schedule for 4-6 weeks**

Yogic training	Duration	Repetition	Sets	Rest between practices	Rest between Sets	Frequency/week
Sitilikarana Vyayama (loosening exercises)	3 min	3	2	3-6 s		
Surya Namaskar	4 min	3	2	5-8 s	3-5 min	5 days/week
Salabasana	2 min	3	3	3-6 s		
Halasana	3 min	3	3	3-6 s		
Bhujangasana	3 min	3	3	3-6 s		
Ustrasana	3 min	3	3	3-6 s		
Vibareethakarani	3 min	3	3	3-6 s		
Dhanurasana	3 min	3	2	3-6 s		
Paschimotanasana	3 min	3	2	3-6 s		
Savasana	6 min	1	-	-		
Nadi Shodhana Pranayama	4 min	3	1	3-6 s		
Bhastrika	4 min	3	1	-		

finger pulse oxymeter. Participants information sheet were completed by each participant.

Participant's complete medical history and information sheet were collected before starting of study. Adherence and compliance were checked by attendance records maintained by yoga instructor. Participants were instructed to continue yoga session for 6 weeks intervention period. At end of 6 week, a feedback form was used to assess happiness and hurdle faced by participants of study.

Ethical approval was taken from Institute Ethical Committee (AIIMS/IM/RC69/2015/07) on dated 27.08.2016 in accordance with Helsinki Declaration. After explaining the aim of this study to each participant, written informed consent was obtained from each participant of study.

Data analysis was done by using SPSS version 23.0. For participants, information sheet frequency and percentage were calculated. Effectiveness of yoga therapy was analyzed by using unpaired *t*-test and  $P < 0.05$  was considered significant.

## Results

Out of 40 participants, the mean age of participants was 40.6 years. In both groups, mostly belongs to age groups of 41–45 years, doing heavy work, non-vegetarian, literate and no any family history of obesity. Most of women were have BMI higher than 24.9 kg/m<sup>2</sup> in both groups [Table 4].

After 6 weeks of yoga training, the pulse rate of the experimental group was significantly reduced, which is again also statistically significant. Statistically, there was a significant difference in values of mean of SBP as well as DBP after doing yoga training for 6 weeks among experimental and control groups. So it is hence identified that yoga therapy is an effective method to control BP and pulse rate [Table 5].

## Discussion

In our study, participants mean age was 40.6 years. Another randomized control trial recruited participants from an age group of more than 65 years<sup>[20]</sup> indicating that in our study most of the participants were of a young age. The majority were heavy worker, nonvegetarian and literate and had no family history of obesity, where no any study shared this types of participant's information sheet which could be helpful to explore more details about participants.

**Table 4: Participants information sheet of experimental and control group (n<sub>1</sub>=20, n<sub>2</sub>=20)**

Variables	Options	Experimental group		Control group	
		f	%	f	%
Age		Mean=40.6		Mean=40.6	
	30-40 years	07	35	08	40
	41-45 years	13	65	12	60
Occupation	Sedentary worker	06	30	06	30
	Moderate worker	07	35	06	30
	Heavy worker	07	35	08	40
Food pattern	Vegetarian	08	40	09	45
	Non-vegetarian	12	60	11	55
Education	Literate	20	100	20	100
	Illiterate	00	00	00	00
Family history of obesity	Hereditary	08	40	07	35
	Nonhereditary	12	60	13	65
Body Mass Index	<24.9 kg/m <sup>2</sup>	01	05	02	10
	>24.9 kg/m <sup>2</sup>	19	95	18	90

The current study found that 6 weeks of yoga training reduces the pulse rate of the experimental group than control group. The review article also concludes that yoga training has an effect on heart rate and control variability.<sup>[21]</sup> Yoga training for 6 weeks among experimental and control group shows significantly difference in mean of SBP as well as DBP after doing and maintain BP. Hence, it proves yoga therapy is an effective method to control BP among hypertensive patients or chronic diseases. A meta-analysis also reported that yoga can be recommended for reducing BP as an effective intervention.<sup>[22]</sup> Another longitudinal study was conducted to assess the effects of yoga therapy on quality of life and obesity levels among women. The study was conducted for 3 months showed a significant decreases in all physiological variables like SBP (0.01), DBP (0.03) and pulse rate (0.001), all of which were found statistically significant.<sup>[23]</sup> The practice of yoga therapy with meditation calms our mind, which further promotes our mental alertness, lead to normal healthy life. When a person practices yoga and meditation, there appetite also reduced and craving for food reduced. Yoga therapy helps women achieve inner balance and reduces stress levels.

The novelty of this study is that yoga can be integrated this yoga techniques along with regular treatment for hypertensive patients. Yoga must be a way of living for every human being. The novel aspects of our study were randomized control design, structured yoga training session, good compliance, control group and had women population.

## Conclusion

Out of various treatment modalities, yoga therapy should be preferable therapy used for overweight women, which could be easily adopted by them. As this study involves only a small sample size and follow-up for one and half month only. As a researcher, we suggest for large sample size study with a long-term follow-ups to final shows yoga therapy efficacy. Yoga therapy can be effectively and easily introduced in the school and college curriculum to manage childhood obesity also, as in developing countries this major problem among developing countries.

Yoga therapy should be an integral part of hypertension patient's treatment that helps us to treat a human holistically including their physical, mental, social and spiritual health. Yoga therapy has preventive nature, while it could be used for curative and restorative purposes in some chronic diseases. So significant

**Table 5: Comparison of pulse rate and blood pressure of experimental and control group**

Physiological variables	Group	Pretest value	Posttest value	SD	t	P
1. Pulse Rate	Experimental group	80.40	77.05	2.62	35.78	0.000*
	Control group	81.35	80.40	2.84		
2. Systolic BP	Experimental group	146.89	140.23	4.24	13.11	0.000*
	Control group	147.90	146.11	5.20		
3. Diastolic BP	Experimental group	86.70	80.20	3.40	24.78	0.000*
	Control group	88.40	86.40	4.32		

\*Significance at P<0.05 level

changes were observed in physiological variables in our study that suggested that yoga therapy is beneficial therapy and improves quality of life of women by reducing stress level and decreases weight also.

### Declaration of patient consent

The authors certify that they have obtained all appropriate participants consent forms. In the form, the participants has given their consent for their images and other clinical information to be reported in the journal. The participants understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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