

## To Study the Effects of Yogasana and Pranayama on Anthropometry and Lipid Profile of Normotensive and Hypertensive persons

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### ABSTRACT

**Introduction:** Higher anthropometric values, deranged lipid profile, age etc. are causative factors contributing rise in blood pressure and lead to origin and progression of hypertension. The higher BMI, waist circumference (WC), hip circumference (HC), W/H ratio and higher lipid profile and decreased level of HDL are lifestyle born health problems worldwide. People are now trying the alternative therapies for complete relief from hypertension. Yoga is proving best alternative therapy and act as mind body medicine for cardiac risk factors.

**Material & Method:** Total 100 subjects, having 50 normotensive and 50 hypertensive of age 31-60 years, were screened with physician help for their inclusion in the study on the basis of inclusion and exclusion criteria. All baseline pre yoga parameters of anthropometry, blood pressure (BP) and lipid profile were measured. Subjects were given three months of yogasana and pranayama practice. Post yoga anthropometric, BP and lipid profile parameters were recorded. Data collected was tabulated, and analysed by SPSS statistical software.

**Results:** The significant decrements were observed in anthropometric parameters such as body weight, BMI, WC, HC, and W/H ratio ( $P < 0.0001$ ). There was also statistically significant decrement observed in BP ( $P < 0.0001$ ), lipid profile & increase in HDL ( $P < 0.0001$ ). The decrement in parameters was more in hypertensive than normotensive after yogasana and pranayama practice.

**Conclusion:** Hypertensive patients get relief by yogasana and pranayama. Reduction in BP also occurs in normotensive by yoga regimen. This reduction is correlated with simultaneous decrease in BMI, adiposity parameters and lipid profile.

**Keywords:** Anthropometry, BMI, Hypertension, Lipid Profile, Yoga

### INTRODUCTION

Higher anthropometric values like BMI, WC, HC, W/H ratio, shows trends of overweight and obesity[1]. These also represent adiposity and deranged lipid profile. These are the lifestyle related parameters and main causative factors of disorders like hypertension, diabetes, metabolic syndrome etc. Hypertension, higher BMI and dyslipidaemia are always co-exists[2]. Apart from BMI, the WC, HC, W/H ratio shows adiposity [3]. Many

epidemiological studies shown higher cholesterol in hypertensive than matched normotensive population [4,5].

Hypertension is continuous elevated blood pressure equal or more than 140/90mmHg. It is given by the WHO & researchers that the prevalence of hypertension, worldwide showing 26.4%, in the adult population. In 2000, people had hypertension in

which 26.6% of men and 26.1% of women and it is projected to have 29.2% by the year 2025[6,7]. This means 1 out of every 4 adults being affected with hypertension. The prevalence of hypertension is 30 to 40 percent in Indian population. Hypertension is a silent killer. In our country 57 % stroke deaths and 24% congestive heart diseases (CHD) are due to hypertension. WHO warns that Hypertension is the major public health problem in developing countries. Approximately 40% of the persons with essential hypertension also have hypercholesterolemia. Genetic studies have established a clear association between hypertension and dyslipidaemia [8]. Target organ damage by hypertension is potentiated by age, gender, high sodium intake, diabetes, smoking, alcohol habits, heredity and sedentary lifestyle[9].

In lifestyle related pathophysiology of hypertension, apart from pharmacological treatment, popularity is continuously increasing for nonpharmacological alternative therapies. Yoga is proving best among them, and acting by the way of mind-body medicine. Yoga is the most valuable gift of the Indian philosophy. It is the old system of body asanas, respiration practices, and meditation practiced for the practitioner's body, mind and spirit. Yoga's principles were first written down by a scholar Patanjali in the second century B.C.[10]. Sage Patanjali explained yoga by Ashtang sutra, that are the eight limbs of life discipline. It includes Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana, and Samadhi. Among these eight limbs, Asana, Pranayama & Meditation are used as therapy for cure from or remain away from diseases. It has been, proved now that pranayama and certain Asanas are a very important for preventing and curing many health problems[11]. Yogasana and Pranayama has beneficial effect on different system of body thereby increasing longevity, bringing equipoise between psychological and physical aspects of bodily function. Yoga practices are gaining increasing popularity in many countries around the world, by the way of various postures and breathing techniques[12].

Stretching asanas such as forward bending, twisting, backward bending in different body positions, decreases the fat content of abdomen and hip region, thereby it reduces the body weight, which in turn reduces blood pressure and cholesterol level[13]. Relaxing asanas and pranayama reduce stress and

stress related over activation of HPA axis. This inhibit sympathetic system and contribute to lowering the BP and restores lipid profile[14]. The study conducted to see the effects of yoga on lipid profile and anthropometry related problems, in normotensive shown alteration in lean body mass and decrease in skin fold thickness[15].

Few scientific studies have been dedicated to the effect of yoga on anthropometric and lipid profile variables to lay a scientific foundation regarding benefits of yoga, but its effect is not clearly detected yet. Therefore, this study was conducted to assess the effect of yoga on anthropometric and lipid profile variables in normotensive and hypertensive.

**MATERIAL AND METHOD-** The objectives of our study were to see the effects of yogasana and pranayama on anthropometric and lipid profile parameters of normotensive and hypertensive persons. Suitable to objective the enrolment of participant, study parameters and the required instruments were finalised. The normotensive participants were selected from Aurangabad City of Maharashtra state by the randomisation, by measuring the blood pressure and health status by physician. The hypertensive patients visiting to MGM Medical College Hospital were selected after screening by the physician. The enrolment was done by following the inclusion and exclusion criteria. On the basis of sample size calculation, 50 normotensive and 50 hypertensive participants having age of 31 to 60 years, were selected. Study purpose was explained to every participant. Informed written consent was obtained from them for inclusion in the study. Ethical clearance was taken from Institutional Ethical Committee for research on human subjects of MGM Medical College Aurangabad.

#### **Inclusion criterion:**

- 1) Healthy, normotensive, ready to do yoga for three months daily for one hour (6 days/week)
- 2) Hypertensive persons taking antihypertensive treatment at least from one year and ready to do yoga.
- 3) Having age between 31 to 60 years.

#### **Exclusion criterion:**

- 1) Subjects already practicing yogasana and pranayama.

- 2) Subjects with other cardiovascular diseases (CVDs) and or respiratory diseases.
- 3) Subjects with any systemic diseases, history of cancer.
- 4) Subject with memory impairments, mental or psychiatric disorders, and
- 5) Subjects under any specific medications, apart from antihypertensive drugs.

The baseline parameters were measured and labelled as pre yoga parameters. The anthropometric parameters selected were height, weight, BMI, HC, WC, W/H ratio. The height was measured by stadiometer. The weight was measured by digital weighing machine for exact and unbiased reading. BMI was calculated by using formula -  $\text{Wt. in Kg} / \text{Ht. in M}^2$ . Waist circumference was measured by measuring tape by placing it on lower abdominal region, expressed in cm. The hip circumference was measured by placing tape on the mid hip region, and expressed in cm. The W/H ratio was calculated.

The resting BP was measured by digital BP apparatus of Citizen make. The systolic BP (SBP) and diastolic BP (DBP) was measured in supine position and expressed in mmHg. For the lipid profile parameters early morning schedule was planned. The participants were called in batches of 10-15 each at 8.00 clock morning with empty stomach for fasting blood sample. Sample was collected by expert laboratory technician. By using autoanalyzer Selectra-Pro-M serum lipid profile was done. The parameters measured were T. cholesterol, Triglycerides, HDL, LDL, TC/HDL ratio.

After collection of pre yoga data the yogasana and pranayama schedule was arranged. Among the 8 limbs of Ashtang yoga, two main limbs were selected for intervention. Those were Yogasana and pranayama which are more effective therapeutically [16,17]. As per objective of the study yoga intervention was arranged one hour daily for three months, for six days in a week. It was given in early morning under the guidance of expert Yoga teacher from Yoga, centre in city. The stretching and relaxing asanas and pranayama were practiced in the schedule.

**Table: 1 List of selected Yogasana and Pranayama.**

Sr. No.	Yogasana and pranayama	Time
1	Prayer and omkar chanting	3 min
2	Warmup movements	3 min
3	Bhujangasan	2 min
4	Setubandhasan	2 min
5	Pawanmuktasan	2 min
6	Shavasan	3 min
7	Vajrasan	3 min
8	Vajrasan Yogmudra	2 min
9	Pachimottanasan	3 min
10	Makarasan	3 min
11	Virasan	2 min
12	Trikonasana	3 min
13	Shavasan	3 min
	<b>Pranayama with pose padmasana or sukhhasana</b>	

14	Anulom vilom ( alternate nostril breathing )	5 min
15	Bhramari	3 min
16	Sheetali	3 min
17	Prayer, Omkar chanting	3 min

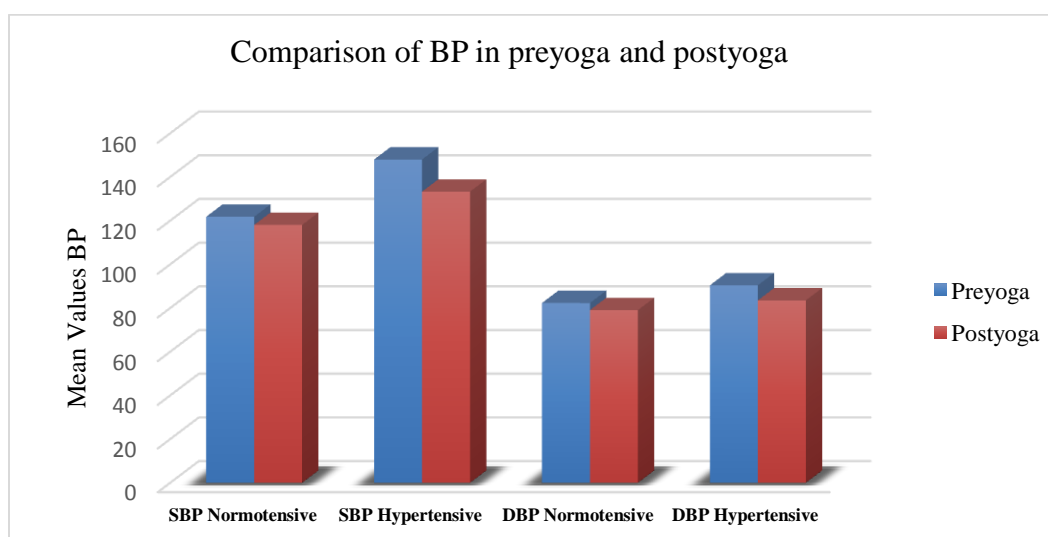
The postyoga data was collected after yoga schedule. Collected pre yoga and postyoga data was tabulated systematically as per statistical requirement. Student's paired 't' test was applied to the collected data. The results were displayed and analysed. The statistical software SPSS was used for calculation of different values.

## RESULTS:

**Table 2: Preyoga postyoga comparison of both groups of blood pressure**

Variable	Groups	Mean $\pm$ Std. Deviation		t	P value	Significance
		Pre Yoga	Post Yoga			
RSBP mmHg	Normotensive	121.79 $\pm$ 2.61	118.04 $\pm$ 2.23	16.272	p<0.0001	Significant
	Hypertensive	147.99 $\pm$ 6.42	133.28 $\pm$ 6.52	47.24	P<0.0001	Significant
RDBP mmHg	Normotensive	82.31 $\pm$ 2.78	79.05 $\pm$ 2.63	28.133	p<0.0001	Significant
	Hypertensive	90.4 $\pm$ 3.45	83.5 $\pm$ 2.85	65.29	P<0.0001	Significant

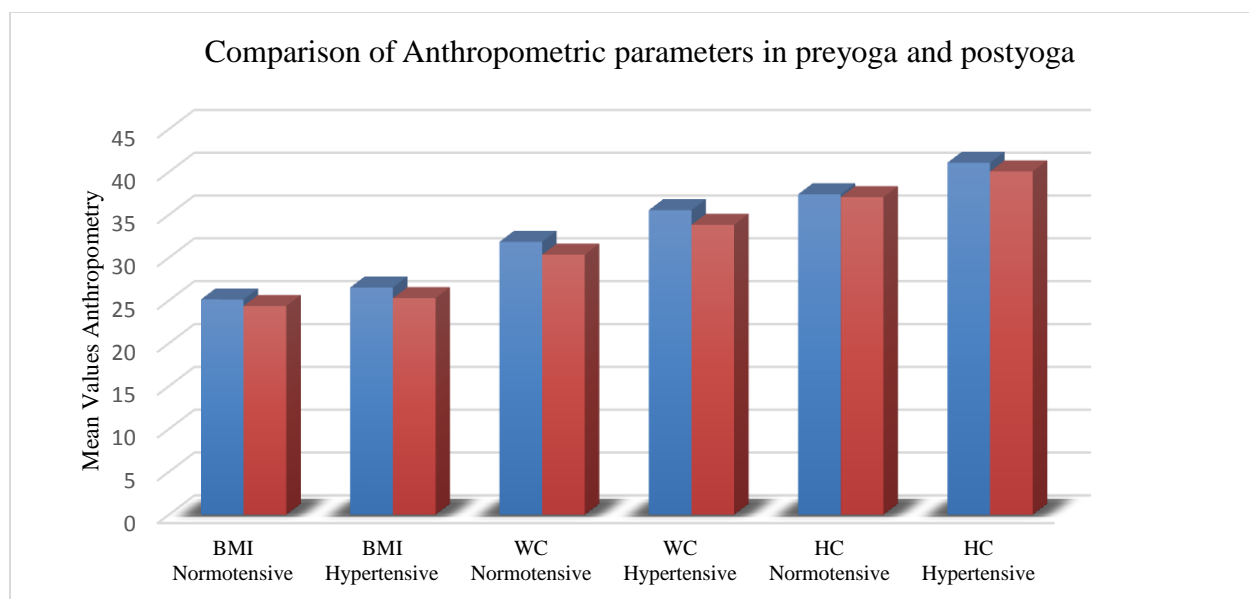
**Fig. 1 Comparison of BP in preyoga and postyoga**



**Table 3: Preyoga postyoga comparison of both groups of anthropometric parameters**

Variable	Groups	Mean $\pm$ Stad. Deviation		t	P value	Significance
		Pre Yoga	Post Yoga			
Ht. cms	Normotensive	164.90 $\pm$ 7.66	164.90 $\pm$ 7.66			
	Hypertensive	165.19 $\pm$ 5.72	165.19 $\pm$ 5.72			
Wt in kg	Normotensive	68.2 $\pm$ 6.33	66.06 $\pm$ 6.31	19.565	p<0.0001	Significant
	Hypertensive	72.81 $\pm$ 7.45	69.8 $\pm$ 7.29	22.68	P<0.0001	Significant
BMI Kg/M2	Normotensive	25.12 $\pm$ 2.6	24.36 $\pm$ 2.42	11.88	p<0.0001	Significant
	Hypertensive	26.52 $\pm$ 2.2	25.57 $\pm$ 2.18	9.33	P<0.0001	Significant
WC cm	Normotensive	31.85 $\pm$ 1.75	30.35 $\pm$ 1.65	19.992	p<0.0001	Significant
	Hypertensive	35.55 $\pm$ 3.25	33.83 $\pm$ 3.66	24.45	P<0.0001	Significant
HC cm	Normotensive	37.39 $\pm$ 2.1	37.06 $\pm$ 2.26	5.797	p<0.0001	Significant
	Hypertensive	41.08 $\pm$ 2.81	40.6 $\pm$ 3.02	5.92	P<0.0001	Significant
WHR	Normotensive	0.85 $\pm$ 0.04	0.82 $\pm$ 0.04	18.643	p<0.0001	Significant
	Hypertensive	0.86 $\pm$ 0.05	0.83 $\pm$ 0.05	15.03	P<0.0001	Significant

**Fig. 2 Comparison of Anthropometric parameters in preyoga and postyoga**

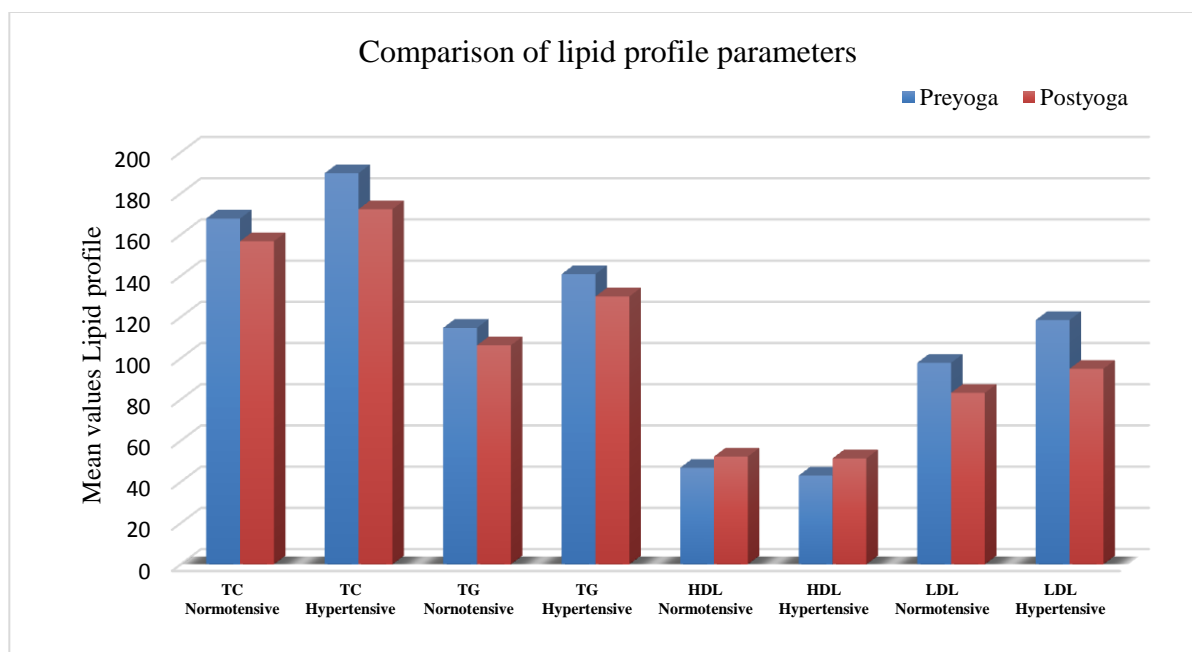


**Table 4: Preyoga postyoga comparison of both groups of lipid profile parameters**

Variable	Groups	Mean $\pm$ Stand. Deviation		t	P value	Significance
		Pre Yoga	Post Yoga			
TC mg/dl	Normotensive	167.82 $\pm$ 10.94	156.8 $\pm$ 11.15	28.281	p < 0.0001	Significant
	Hypertensive	189.82 $\pm$ 14.02	172.35 $\pm$ 13.52	34.72	p < 0.0001	Significant
Triglyceride mg/dl	Normotensive	114.78 $\pm$ 15.81	106.29 $\pm$ 15.43	43.279	p < 0.0001	Significant
	Hypertensive	140.87 $\pm$ 9.3	130.03 $\pm$ 9.4	85.18	p < 0.0001	Significant
HDL mg/dl	Normotensive	46.84 $\pm$ 4.31	52.33 $\pm$ 4.11	-50.453	p < 0.0001	Significant
	Hypertensive	43.08 $\pm$ 5.0	51.44 $\pm$ 4.88	-86.172	p < 0.0001	Significant
LDL mg/dl	Normotensive	97.79 $\pm$ 12.14	83.22 $\pm$ 11.96	32.681	p < 0.0001	Significant
	Hypertensive	118.56 $\pm$ 13.86	94.9 $\pm$ 12.96	40.332	p < 0.0001	Significant
TC/HDL Ratio	Normotensive	3.6 $\pm$ 0.44	3.01 $\pm$ 0.31	30.824	p < 0.0001	Significant
	Hypertensive	4.46 $\pm$ 0.59	3.37 $\pm$ 0.36	37.114	p < 0.0001	Significant

**Fig. 3 Comparison of lipid profile parameters in preyoga and postyoga**





**Analysis** – In the comparison of blood pressure in preyoga postyoga from table 2, fig 1, results show statistically significant reduction in both systolic and diastolic BP with p value less than 0.0001. In hypertensive, figures show more decrement in blood pressure. Table 3, and fig 2, the values in anthropometric parameters shows decrement in postyoga parameters. Its results were statistically significant with p values less than 0.0001. The results in lipid profile from table 4 and fig 3 shows, decrement in postyoga parameters of T. cholesterol(TC), triglyceride(TG), low density lipid (LDL) and TC/HDL ratio, while value of high density lipid(HDL) was increased. All values changed statistically significant with p values less than 0.0001.

**DISCUSSION** – Our study results were shows significant changes by yogasana and pranayama in normotensive and hypertensive persons. The anthropometric parameters were decreased significantly. The results of decrease in our study parameters like body wt, BMI, HC, WC, W/H ratio have supported by the study of Seo D.Y. et al<sup>[18]</sup>. This yoga intervention is showing reduction in hypertension by altering lipid profile and BMI. The changes might be due to changes in metabolic hormones like lectin and adinopectin as shown by Keikolt-Glaser et al<sup>[19]</sup>. By stretching and relaxing asana and also pranayama in the study increases the peripheral utilization of TC, TG and LDL reduces the body wt, BMI, WC and HC<sup>[20]</sup>. Chauvan A. et al<sup>[21]</sup>

shown just one month practice of yoga is also showing reduction in BMI, SBP, DBP. In their study participants were between age group of 22-69 years and of both genders. Their results showed that reduction of BMI was due to some asana which reduces deposit of fat in adipose tissues. Some asanas and pranayama calms mind, reduces stress and balance the ANS and improves BP. Similar findings of BP was observed in our study. This decreases hypertension and reduces medication. After short term intervention of yoga also shows reduction in anthropometric parameters as shown by Rashmi Yadav et al<sup>[22]</sup>. The improvement in BP and BMI are supported by Sujata T. et al<sup>[23]</sup>. This improvement in BP and BMI may be due to reduction in stress at neurophysiological level, decreases activation of HPA axis. This inhibits the sympathetic system, and helps in reduction of BP.

Dyslipidaemia is related to atherosclerosis and cardiovascular diseases like hypertension. The significant reduction in TC, TG, LDL and TC/HDL ratio are observed after yoga in our study. Positive change in lipid profile by yoga intervention is may be due to elevated level of liver enzymes transferred at cellular level, which affects metabolism of lipoprotein and increases the uptake of TG by adipose tissue. All cells synthesize the cholesterol, but only liver cells are capable of metabolize and excrete it. Cholesterol is transported from cells to liver by HDL-mediated transport called as reverse cholesterol transport. Thus HDL plays very important

role in reducing level of TC, TG & LDL cholesterol. It is excreted in bile directly or after conversion to bile salts<sup>[24,25]</sup>. A.S. Mahajan et al in 1999 studied lipid profile in coronary risk subjects and normal subjects after yogic intervention. The parameters contain the weight, total cholesterol, triglycerides, HDL, LDL and the cholesterol / HDL ratio. After measuring the baseline parameters, the separation of angina patients and other risk factors subjects was done. The yoga practicing showed a regular fall in all the lipid parameters except HDL, which is raised<sup>[26]</sup>. The SBP, DBP, HR, and lipid profile were significantly reduced and HDL cholesterol increased statistically significant. This decrease in all these parameters after yogic practices considered beneficial for hypertensive and other cardiovascular patients<sup>[27]</sup>.

**Conclusion:** - The elevated level of anthropometric parameters, lipid profile are responsible for cardiovascular risk and hypertension. The significant reduction in body weight, BMI, HC, WC and TC/HDL ratio and increase in HDL observed after yogasana and pranayama practice of three months. After yoga intervention reduction in BP takes place in hypertensive and normotensive. Our results shows the yoga intervention is very beneficial for chronic diseases like hypertension and acts as mind body medicine.

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