

ORIGINAL ARTICLE

Effect of Yoga (Asana and Pranayama) on Serum Lipid Profile in Normal Healthy Volunteers

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ABSTRACT

Introduction: Coronary heart disease (CHD) is one of the major causes of death for both men and postmenopausal women in western world. The prevalence of cardiovascular disease (CVD) is rising worldwide and it accounts for 17 per cent of the total mortality. Dyslipidemia is one of the important modifiable risk factors in CHD. Thus prevention of dyslipidemia is one of the factors to prevent CHD. Out of a myriad of methods like exercise, dietary modification, yoga etc, this study was conducted on normal healthy volunteers, to evaluate the effect of Yoga (Asana and Pranayama) on blood lipid profile.

Materials and methods: The study was conducted on 62 healthy volunteers of Yoga school in Sambalpur between the age of 20-60 yrs. Out of them 37 were men and 25 were women. The lipid profile was observed prior to initiation Yoga training and after 6 month, 1 year and 2 years of Yoga training. Statistical analysis was done by using ANOVA test.

Results: It was found that there was a significant rise in S.HDL cholesterol and a significant fall in S. Total Cholesterol, TGs, LDL and VLDL Cholesterol in both men and women.

Conclusion: The results of the present study indicate that Yoga (Asana and Pranayama) can be helpful in patients with lipid metabolism disorders such as Coronary Artery Disease, Diabetes Mellitus and Dyslipidemia etc. Also Yoga can be used for the primary prevention of coronary heart disease.

Keywords: Yoga, Asana, Pranayama, Cholesterol, Triglycerides, HDL, LDL, VLDL.

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INTRODUCTION

Coronary heart disease (CHD) is one of the major causes of death in the world for both men and post-menopausal women.¹ The prevalence of cardiovascular disease (CVD) is rising worldwide and it accounts for 17 per cent of the total mortality.² There are various risk factors for the development of CHD, which can be grouped into modifiable and non-modifiable risk factors. Out of all these, dyslipidemia is one of the important modifiable risk factors of CHD.³ Besides the involvement of coronary artery, it affects various regions of the circulation and yields distinct clinical manifestations depending on the particular circulatory bed affected.⁴ It initiates atherosclerotic plaque formation in coronary arteries, finally resulting in degeneration of endothelial cell function, which enhance coagulability of blood by activation of various factors for which apolipoproteins have been implicated. Hypercholesterolemia (increase in LDL cholesterol), combined hyperlipidemia (increase in triglycerides and LDL cholesterol) and hypertriglyceridemia are three important risk factors for CHD.⁵ The modification of lipid profile may be important in both prevention and control of CHD.⁶

Various attempts have been performed to control the serum lipid content in efforts to treat and prevent coronary artery disease such as physical exercises,⁷⁻⁹ dietary modifications¹⁰⁻¹¹

and combined diet and exercise trials.¹² A study conducted on patients with angina and coronary risk factors¹³ showed decrease in the values of lipid profile after 4-14 weeks of yogic practices, while another study conducted on subjects with mild to moderate hypertension reported that yoga can play an important role in risk modification for cardiovascular diseases.¹⁴ Jensen RG et al had reported in a study that the long and medium term meditators have better lipid profile when compared to non-meditators in spite of similar physical activity.¹⁵ Studies were conducted to evaluate the effect of Pranayama and yoga, in normal volunteers, on cardio-respiratory efficiency^{16,17} and bone metabolism¹⁸ have resulted in a significant improvement in numerous physiological systems. While another study conducted on normal healthy individuals had resulted in an improvement in lean

body mass and a reduction in fat skin fold thickness¹⁹ after yogic practices. A study was conducted by Prasad et al, to observe the effect of yoga on normal healthy volunteers. The results indicated that HDL-cholesterol was elevated in men with Pranayama, while triglycerides and LDL-cholesterol decreased in women after yoga asanas.

Now-a-days people of Western Odisha are following sedentary life styles. Along with the physical inactivity, the dietary pattern is also deranged with more fat containing food and less dietary fibers. All these conditions lead to morbid obesity, dyslipidemia and are high risk factors for developing CHD. So the modification of lipid profile may be important in both prevention and control of CHD. This modification of lipid profile can be achieved by practicing Yoga. Yoga actually is a way of life, Yoga life style consists of complete physical, mental, emotional and spiritual wellbeing which corroborates well with the WHO definition of health.

So the aim of the study is to find out the effect of Yoga on lipid profile of normal healthy volunteer in this part of globe and to observe the effect of long duration of yoga on lipid profile. Our study is the first one that gives idea about effect of prolonged duration of yoga on lipid profile. Asana (stable posture) and pranayama (breath control)²⁰ is the objective thing and the effect of these two steps on the body can be observed by measuring various parameters and hence considered for the study.

MATERIALS AND METHODS

With written consent and approval of institutional ethical committee the study was conducted on an outpatient basis at the Department of Physiology, VSS Medical College, Burla with the help of Department of Biochemistry for a duration of 2 years. 62 trainees (37 men and 25 women), aged 20-60 yrs of Yoga School, Sambalpur were selected. These volunteers included housewives, students and executives. All volunteers were normal healthy persons with no history of smoking, alcohol intake or any other type of addiction and were not involved in heavy physical exercises based on the information given by the subjects during admission. Subjects suffering from any endocrine, hepatic, renal disease, hypertension, diabetes, cardiopulmonary disease, history of drug intake like beta blockers, lipid lowering drugs were excluded from the study. The subjects were asked to follow their routine diet. They were not doing any type of exercise during the period. None of the subjects were exposed to yogic practices before joining the yoga course.

Yoga Training

All subjects were taught Pranayama and Asana, for one hour from 6.00 am to 7.00 am according to Swami Sivananda Yoga schedule without prior breakfast. The bladder and bowel was emptied prior to Yogic practices. The duration of Pranayama was for 30 minutes and that for Asana was 30 minutes too.

Yoga Protocol

In pranayama, they were practising Om Karanada, Anulom-Vilom, Kapalabhati and Bhastrika. Asanas included Suryanamaskar, Bhujangasana, Paschimottanasana and Shavasana. Each class was started with Om Karanada for 5 min followed by Anulom-Vilom, Kapalabhati each for 10 min and Bhastrika for 5 min. Then all the subjects were practicing Suryanamaskar for 8 min followed by Shavasana for 5 min. After Shavasana again they were practicing Bhujangasana and Paschimottanasana each for 6 minutes and finally one day of class was completed with 5 min of Shavasana at the end.

Sample Collection

After 12 hours of fasting, the blood was collected from antecubital vein before yogic practices, after 6 months, 1 year and 2 years of yogic practices. On the day of collection, the subjects were abstain from yogic practices and were in empty stomach. The time of blood collection was 7.00 to 8.00 am. The blood samples were collected in sterile bottles without anticoagulant and allowed to clot. The serum was analyzed for lipid profile. Serum Total Cholesterol (TC), Triglycerides (TGs), High density lipoprotein (HDL), Low density lipoprotein (LDL), Very low density lipoprotein (VLDL) were estimated by using auto analyzer. According to American Heart Association Cholesterol > 200 mg/dl, Triglyceride value > 150 mg/dl, HDL cholesterol < 45 mg/dl, LDL cholesterol > 130 mg/dl and VLDL cholesterol > 40 mg/dl were defined as lipid disturbances.

STATISTICAL METHODS

The data were expressed as mean \pm SD. Analysis of data was done with the help of computer by SPSS Programme version of 12.0 software facilities. ANOVA test was done. P value < 0.05 is considered significant.

RESULTS

The study was conducted in 62 trainees out of which 37 were men and 25 were women.

Anthropometric Data

Table 1 represents the anthropometric data of subjects, which lies within normal limit. BMI of subjects is less than 25 kg/m² and waist hip ratio is less than 0.8 in female and less than 0.9 in male.²¹ Persons having normal BMI and waist hip ratio were included in the study sample to avoid BMI and waist hip ratio as a confounding factor.

Gender distribution

The present piece of research included a study group of 62 individuals from a varied age and gender. As would be seen from table- 2, 60% belong to men and 40% belong to women.

Lipid profile

Lipid profile values were analyzed by using ANOVA. Anova- single factor was done at $p < 0.001$ and it was found that a significant reduction in the levels of serum total cholesterol, triglycerides, LDL and VLDL-cholesterol and increase in HDL-cholesterol at the end of 6 month, 1 year and 2 year of yoga among men (Table 3), in women (Table 4).

Duration of yoga and lipid profile

As is evident from table 5, it is clear that, practicing yoga for prolonged duration bring about a stability of normal level of lipid profile values.

DISCUSSION

Yoga aims at self regulation; it is a form of subjective self regulation. It acts both at conscious and subconscious levels.

Gender	Age	BMI	W:H
Male (n= 37)	46.86±7.58	23.03±0.03	0.85 ± 0.06
Female(n=25)	44.51±7.48	21.32±0.02	0.77± 0.04

Table-1: Anthropometric data of the subjects

Gender	Number	Percent
Men	37	59.67%
Women	25	40.32%

Table-2: Gender distribution of the sample

The advantage of Yoga is that with proper training it becomes a way of life and as such does not require any conscious effort on the part of the individual. Yoga helps to control the involuntary functions of the body and it maintains the balance between the parasympathetic and sympathetic system of the body. The modification of lipid profile can be achieved by practicing Yoga. The present study showed that Yoga leads to decrease in TC, TG, LDL, VLDL and increase in HDL like a study carried out by Santakumari N et al.²²

Gender and lipid profile

A study conducted by Prasad et al was evaluated the impact of Pranayama and Yoga on lipid profiles and free fatty acids after 90 days of yoga training. The results indicated that HDL cholesterol was elevated in men with Pranayama, while TGs and LDL cholesterol decreased in women after Yoga asanas.²³ Another study concluded that Raja yoga meditation lowered serum cholesterol and low density lipoprotein - cholesterol in post-menopausal women thus reducing the risk of coronary artery disease in them.²⁴ Our study showed there was a significant decrease in TC, TG, LDL and VLDL in both men and women and significant increase in HDL in both genders which is in corroboration with the study carried out by BK Acharya et al.²⁵ Decrease in TC, TG, LDL, VLDL and increase in HDL is more in males as compared to females.

HDL cholesterol which is considered as cardioprotective is

Parameters in men	Before Yoga	At 6 month of Yoga	At 1 yr of Yoga	At 2 yrs of Yoga	F _{crit} F _{cal}	P value
TC	180.81±11.71	173.7±10.79	168.94±9.73	167.62±9.19	2.67 12.17	<0.001*
TG	157.0±9.08	151.24±7.25	148.97±6.57	148.3±6.13	5.72 10.51	<0.001*
HDL	38.16±4.89	44.84±4.23	46.57±4.44	47.03±4.51	5.72 30.41	<0.001*
LDL	141.62±10.11	141.30±10.18	136.57±7.57	126.32±3.66	5.72 27.39	<0.001*
VLDL	45.65±7.82	42.27±6.09	37.3±3.6	35.65±2.75	5.72 26.23	<0.001*

*P value <0.005

Table-3: Effect of Yoga on lipid profile in different period of yoga in men

Parameters in women	Before Yoga	At 6 month of Yoga	At 1 yr of Yoga	At 2 yr of Yoga	F _{crit} F _{cal}	P value
TC	175.84±10.47	172.6±9.56	169.08±9.07	167.6±8.82	2.69 3.78	<0.001*
TG	153.08±6.13	147.68±4.57	146.12±4.4	145.4±4.36	5.87 12.46	<0.001*
HDL	45.28±3.66	46.88±3.23	47.36±3.41	47.88±3.35	2.69 2.73	<0.001*
LDL	132.2±11.18	131.64±11.21	127.64±8.87	121.12±7.18	5.87 6.85	<0.001*
VLDL	42.52±3.62	39.44±3.32	35.88±1.99	34.24±1.42	5.87 45.6	<0.001*

*P value <0.005

Table -4: Effect of Yoga on lipid profile in different period of yoga in women

Parameters	Difference of means in women		Difference of means in men	
	before yoga-1 yr of yoga	1yr-2 yr of yoga	before yoga-1yr of yoga	1yr-2yr of yoga
TC	6.76	1.48	11.87	1.32
TG	5.4	0.72	8.03	0.72
HDL	-2.08	-0.52	-8.41	-0.46
LDL	4.56	6.52	5.05	10.25
VLDL	6.64	1.64	8.35	1.65

Table-5: Duration of yoga and lipid profile

increasing significantly in our study unlike the study conducted by Sangeeta Jain et al, in which there is a significant decrease of serum cholesterol, triglycerides and HDL levels in Yoga groups as compared to control group. However, no change in LDL levels and VLDL levels were observed.²⁶ Duration of yoga and lipid profile-estimation of serum lipid profile were done before yoga, at 6 months of yoga, at 1 year of yoga and at 2 years of yoga and it was noticed that decrease in TC, TG, LDL and VLDL were more at 6 months of yoga than at 1 year and 2 years and so also the increase in HDL. So, regular yogic practices maintains the lipid profile at a normal range.

Mechanism for change in lipid profile

The improvement in the lipid profile after yoga could be due to increased hepatic lipase and lipoprotein lipase at cellular level, which affects the metabolism of lipoprotein and thus increase uptake of triglycerides by adipose tissues. Yoga is believed to gradually diminish sympathetic dominance, resulting in a better balance between the sympathetic and the parasympathetic system.²⁷ It also brings about a hypo-metabolic state.²⁸ By modifying the state of anxiety, Yoga reduces stress induced sympathetic over activity.²⁷ Thus, a decrease in sympathetic discharge and better ability to overcome stress can be cited as possible mechanisms for the improvement in lipid profile seen in the present study. Metabolic effects include a decreased adrenocortical activity and long term decreased cortisol secretion and decreased thyroid stimulating hormone.²⁹ This may be another cause of decrease in serum cholesterol and LDL-C observed in the present study. Decrease in TG and increase in HDL could be due to hydrolysis of TG-rich lipoproteins that replace intramuscular fat. More increase in HDL in men than in women suggests a sex related response. More decrease in TC, TG, LDL, and VLDL in men than in women suggests the influence of different types of hormones in both sexes. Yoga helps to decrease the level of lipid profile and hence the risk for cardiovascular diseases.

CONCLUSION

The present study had demonstrated a beneficial effect of Yoga on blood lipid profile. So, Yogic practices are definitely helpful in preventing lipid metabolic disorders and it can

be used as a primary prevention of cardiovascular diseases. Again prolonged duration of yoga does not provide any ill health rather it maintains serum lipid profile within the normal range. So, Yoga leads to a better health of population leading to a healthy society.

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