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IMPACT OF PRANAYAMA AND YOGA ON LIPID PROFILE IN NORMAL HEALTHY VOLUNTEERS

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ABSTRACT

Prasad KVV, Sunita M, Raju PS, Reddy MV, Sahay BK, Murthy KJY. Impact Of Pranayama And Yoga On Lipid Profile In Normal Healthy Volunteers. ***JEP****online* 2006;9(1):1-6. The present study was conducted on normal healthy volunteers, 41 men and 23 women, to evaluate the impact of Pranayama and Yoga asanas on blood lipid profiles and free fatty acids, in two stages. In stage-I, Pranayama was taught for 30 days and in stage-II, yogic practices were added to Pranayama for another 60 days. A Significant reduction was observed in triglycerides, free fatty acids and VLDL-cholesterol in men and free fatty acids alone were reduced in women at the end of stage-I. A significant elevation of HDL-cholesterol was seen only in the men at the end of stage-I. At the end of stage-II, free fatty acids increased in both men and women, and women demonstrated a significant fall in serum cholesterol, triglycerides, LDL- and VLDL-cholesterol. The results indicated that HDL-cholesterol was elevated in men with Pranayamam, while triglycerides and LDL-cholesterol decreased in women after yoga asanas. The results of the present study indicate that Pranayama and yoga asanas can be helpful in patients with lipid metabolism disorders such as coronary artery disease, diabetes mellitus and dyslipidemia etc.

Key Words: Pranayama, Yoga, Cholesterol, Triglycerides, Lipoproteins

INTRODUCTION

Coronary heart disease (CHD) is one of the major causes of death in United States (1) for both men and postmenopausal women in western world (2). A study conducted in India suggests that the prevalence of CHD is about 10% (3). Dyslipidemia is one of the important modifiable

risk factors in CHD (4). It initiates atherosclerotic plaque formation, finally resulting in degeneration of endothelial cell function, which enhances the 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 such as physical exercises (7-9) and dietary modifications (10-11) and combined diet and exercise trials (12) have been performed to control the lipid content of the blood in efforts to treat and prevent coronary artery disease. A study conducted on patients with angina and coronary risk factors (13) showed a positive response in 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). Another study had reported that the long and medium term meditators have better lipid profile when compared to non-meditators in spite of similar physical activity (15). Our earlier studies conducted to evaluate the effect of Pranayama and yoga, in normal volunteers, on cardio-respiratory efficiency (16,17) and bone metabolism (18) 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 thickness (19) after yogic practices.
In view of these observations, the present study was undertaken to study the effect of Pranayama and yoga asanas on the lipid profile in healthy volunteers undergoing yoga training for 90 days.

METHODS

41 Male and 23 female volunteers were selected for the study from the students of a three months yoga certificate course conducted by the Vemana Yoga Research Institute, Hyderabad, India. These subjects were aged between 18-30 years and none had a history of lipid metabolism disorders. These volunteers included housewives, students and executives. All volunteers were normal healthy persons with no history of smoking and alcohol consumption and were not involved in heavy physical exercises. The scope and objectives of the present study were explained to the subjects and their written consent was obtained for participation in the present study. The institutional ethical committee had approved the study protocol and design.

The subjects were asked to follow their routine diet and exercise pattern during the period of study. None of them carried out any other physical exercises, based on the information given by the subjects during admission to the certificate course, except yoga, and maintained an average attendance of 82% to 93% in the yoga classes. None of the subjects were exposed to yogic practices before joining the yoga course.

Yoga Training

All subjects were taught Pranayama for 30 days (Stage-I) followed by addition of yogic practices for another 60 days (Stage-II). The duration of practice was for one hour from 6.15 am to 7.15 am, without prior breakfast.

Pranayama - *Rechaka Puraka, Rechaka Puraka* with *Kumbhaka, Suryabedha Chandrabedha, Suryabedha Chandrabedha* with *Kumbhaka*, and *Kapalabhati* was taught for 10 min each, and at the end *Shavasana* was practiced for another 10 min. The descriptions of Pranayama practices were given earlier (18).

After 30 days, Pranayama practices were reduced to 20 min and Yoga asanas were practiced for 40 min for further 60 days. The yogasanas practiced were *Uttanasana, Mandukasana, Ustrasana,*

Yogamudra, Matsyendrasana, Paschimottanasana, Bhujangasana, Sarvangasana, Halasana, Uddiyana, Ardhamatsyendrasna, Dhanurasana, Shalabhasana, Sarpasana and Chakrasana (20).

Blood was drawn from an antecubital vein at the beginning, after 30 days and at the end of study for biochemical investigations, in post absorptive state. The blood was drawn between 7-30 am to 8.00 am, without stasis, and the serum was separated within an hour of collection. On the day of blood collection, the subjects were asked to abstain from the yogic practices. The following investigations were carried out - serum cholesterol (21), triglycerides (22), free fatty acids (22), HDL-cholesterol (23), LDL-and VLDL-cholesterol (24) within 4 hours of serum separation. The above parameters were estimated before commencement of the study (Basal), at the end of 30 days of Pranayama practice (Stage 1) and after 60 days Pranayama and Yoga asanas (Stage 2).

Data are expressed as mean ± SD. Analysis of the results were made using Student's paired `t' test between the initial values and those at the end of stage-I and stage-II and significance was noted at $p < 0.05$. The differences between male and female volunteers, between initial values and those of stage 1 and stage 2 were assessed by repeated measures ANOVA.

RESULTS:

Descriptive characteristics of the subjects are presented in Table 1.

Table 1. Physical Data of the subjects

	Age, yrs	*Height, cm*	*Weight, kg*
MEN (n=41)	24.60 ± 5.44	165.42 ± 6.34	55.91 ± 11.12
WOMEN (n=23)	23.79 ± 4.94	154.68 ± 5.21	45.72 ± 8.61

Values expressed as mean ± SD

There was a significant reduction in the levels of serum triglycerides, free fatty acids and VLDL-cholesterol at the end of stage-I, HDL-cholesterol and free fatty acids were significantly increased at the end of stage 1 and 2, respectively, among men (Table 2) while no significant changes were noted in LDL-cholesterol levels in both stages.

Table 2. Lipid Profile in Men Before and After Yogic Practices

Parameter	Initial	Stage 1	Stage 2
Cholesterol, mmol/L	3.524 ±1.022	3.553 ± 0.264	3.235 ± 0.641
Triglycerides, mmol/L	1.057 ± 0.582	0.797 ± 0.395*	0.954 ± 0.348
Free *Fatty Acids,* mEq/L	0.450 ± 0.079	0.358 ± 0.052*	0.524 ± 0.084*
HDL-Cholesterol, mmol/L	1.109 ± 0.169	1.204 ± 0.197*	1.126 ± 0.199
LDL-Cholesterol**,** mmol/L	1.918 ± 0.986	2.045 ± 0.687	1.708 ± 0.671
VLDL-Cholesterol**,** mmol/L	0.471 ±0.262	0.359 ± 0.171	0.418 ± 0153

Values expressed as mean ± SD; *significant at $p<0.05$

For women, there was a significant reduction in the levels of serum free fatty acids at the end of Stages 1 and 2, whereas cholesterol, triglycerides, LDL-cholesterol and VLDL- cholesterol also recorded a significant fall at the end of Stage 2I (Table 3I). No changes were observed in HDL-cholesterol in both stages.

The ANOVA of repeated measures between male and female subjects at different periods of the study had showed that the levels of serum cholesterol, and HDL-cholesterol were significantly changed in male subjects, after yogic practices (Table-IV). No other differences were observed between any other study variables between the genders.

Table 3. Lipid Profile in Women Before and After Yogic Practices

Parameter	*Initial*	*Stage-I*	Stage-II
Cholesterol, mmol/L	3.972 ± 0.645	3.905 ± 0.649	3.430 ± 0.598*
Triglycerides, mmol/L	1.083 ± 0.527	0.909 ± 0.420	0.804 ± 0.229*
Free *Fatty Acids,* meq/L	0.530 ± 0.120	0.330 ± 0.050*	0.450 ± 0.070*
HDL-Cholesterol, mmol/L	1.250 ± 0.190	1.271 ± 0.188	1.185 ± 0.217
LDL-Cholesterol**,** mmol/L	2.306 ± 0.641	2.286 ± 0.697	1.888 ± 0.473*
VLDL-Cholesterol**,** mmol/L	0.498 ± 0.241	0.414 ± 0.195	0.368 ± 0.105*

Values expressed as mean ± SD; *significant at p<0.05

DISCUSSION

Table 4. Differences between genders in relation to Yogic Practices (ANOVA)

	Chol	*TG*	*FFA*	*HDL-C*	*LDL-C*	*VLDL-C*
F value	4.16	0.236	1.285	4.932	3.278	0.021
p value	0.045*	0.830	0.261	0.031*	0.076	.887

*significant at p<0.05

The effect of exercise and dietary modifications on blood lipid profiles and coronary heart disease (CHD), has been widely reported (7-12). The present study showed a significant fall in total cholesterol in women at the end of 3 months of Pranayama and yoga practice. Male volunteers who went through the similar program did not show any significant change in serum cholesterol levels. The studies conducted in western countries had reported a fall in triglycerides and increase in HDL-cholesterol, after physical activity (7). On the other hand, a generalized reduction had been associated with dietary restriction or correction, including HDL-cholesterol. In the present study, a fall in the triglycerides and VLDL-cholesterol was observed in the men at the end of 30 days of Pranayama practice, whereas in the women it was observed at the end of the study.

It is known that decreased concentrations of plasma HDL-cholesterol lead to increased risk of coronary heart disease whereas rise in its value exerts a protective effect (7). It seems quite probable that increased physical activity leads to lowered plasma triglyceride concentrations and ultimately increased plasma HDL-cholesterol. Physical activity and HDL appear to be linked via HDL's role in triglyceride metabolism (25). A meta-analysis of 59 exercise-training studies reported an average increase in HDL-cholesterol of only 0.052mmol/L (26). The present study had shown a significant rise in the HDL-cholesterol level of 0.104 mmol/L in the men at the end of 30 days of Pranayama practice, but not in women suggesting a possible sex related response. The effect of yogic exercise on body mass showed a significant decrease in fat fold thickness and a significant rise in the lean body mass in normal volunteers at the end of study (19), which suggested that yogasanas and Pranayama cause mobilization of fat deposits.

The diet modifications lead to a generalized fall in cholesterol, triglycerides and both LDL and HDL-cholesterol (27). Conversely, the practice of low amounts of moderate intensity exercise programs do not cause significant variations in these variables (10). The present study, consisting of a low intensity muscle stretches and breathing practices had shown significant changes in the lipid profile at various stages of study in both men and women. The reduction in triglycerides and increase in HDL-cholesterol could be due to hydrolysis of TG-rich lipoproteins that simultaneously replace intramuscular fat used during Pranayama and yogic practices.

The occurrence of significant changes in many of the parameters in men at the end of 30 days of Pranayama is note worthy. Also significant is the observation that women did not show any change in

HDL-cholesterol, similar to studies conducted on physical exercise. The inclusion of a control group might have highlighted the efficacy of Pranayama and yogic practices on CHD. A study carried out on angiographically evident coronary disease patients, the placebo group treated with aggressive dietary and lifestyle intervention did not show any improvement in their symptoms (28), hence the changes in the present study are likely to be attributed to Pranayama and yogic practices.

CONCLUSIONS

The present study had demonstrated the efficacy of Pranayama and Yogasanas on blood lipid profiles in normal healthy volunteers. Yoga practices may be helpful in patients with lipid metabolism disorders such as diabetes mellitus, coronary heart disease and dyslipidemia.

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