



BIOCHEMICAL MODULATION IN REGULAR PRACTICE OF YOGA IN YOUNG HEALTHY MEDICAL STUDENTS

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ABSTRACT

Background: Good health and freedom from disease is the best achievement of life. For thousands of years, yoga an ancient holistic relaxation practice has been used as an effective therapeutic tool that counteracts the adverse clinical conditions of human beings. Yoga has been reported to be beneficial in treating stress related disorders, improving autonomic functions, lower blood pressure, obesity, anxiety, insomnia, psychosomatic disorders, increase strength and flexibility of muscles, improve the sense of well being, slowed ageing process, control breathing, reducing signs of oxidative stress & improving

spiritual growth, a great challenge in the present scenario. **Objective:** The aim of present study was to investigate whether regular practice of Yoga for six months can improve biochemical parameters in young healthy medical students. **Material and Method:** The study group, comprised 45 medical male students aged between 18 -25years. They were trained for 6 months of Yoga. Assessments of various parameters were done before and after Yoga practices, were significantly modulated, statistically by using student's test. **Result:** Regular practice of yoga for 6 months significant reduction in the serum cholesterol, LDL and VLDL (P -.000). but increase in HDL level (P -.000). **Conclusion:** We concluded that regular practice of yoga has brought positive changes in the lipid profile in healthy individuals and can be helpful in patients with lipid metabolic disorders.

KEYWORDS: Yoga, biochemical parameters.

INTRODUCTION

Yoga is a psycho-somatic-spiritual discipline for achieving union and harmony between our mind, body and soul and ultimate union of our individual consciousness with universal consciousness.^[1] Yoga, is a practice of mental and physical exercise techniques, aiming to

acquire good health in human beings. Holistic health, integrative treatment and mind, body medicine are some of the current buzz words in health care originated actually from yoga, which took its birth some 6000 years ago in India and is one of the elements of ayurvedic medicine as the healing science.^[2] The practice improves mood and reduces stress utilizing mind/body strategies designed to promote good health that covers relaxation techniques, hypnosis, visualization, feedback, Qigong, Tai Chi, meditation, autogenic, cognitive behavioral therapy, group therapy and spirituality. All these strategies are based on research conducted to establish if there is a link between the nervous, immune and endocrine systems.^[3] Recently, scientists have explored its consistent beneficial biochemical, physiological, psychological effects in human beings. Yoga based training normalizes the functions of the autonomic nervous system by maintaining both sympathetic and parasympathetic indices toward normal. It is found that yoga has an immediate effect on the HPA axis (hypothalamic - pituitary axis) response to stress.^[4] Though precise mechanism has not yet been established. Its being hypothesized that some yoga exercises via vagus stimulation, lead to a shift toward parasympathetic nervous system predominance. A significant effect of yoga has been noticed in decreasing the blood glucose level, the heart rate and systolic and diastolic blood pressure.^[5]

Coronary heart disease (CHD) is one of the major causes of death in United States^[6] for both men and postmenopausal women in western world.^[7] A study conducted in India suggests that the prevalence of CHD is about 10%.^[8] Dyslipidemia is one of the important modifiable risk factors in CHD.^[9] 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.^[10] The modification of lipid profile may be important in both prevention and control of CHD.^[11]

Various attempts such as physical exercises^[12,13,14] and dietary modifications^[15,16] and combined diet and exercise trials 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 showed a positive response in lipid profile after 4-14

weeks of yogic practice.^[17] Subjects with mild to moderate hypertension reported that yoga can play an important role in risk modifications for cardiovascular diseases.^[18]

Pranayama and yoga in normal volunteers on cardio-respiratory efficiency^[19,20] and bone metabolism^[21] have resulted in a significant improvement in numerous physiological systems and normal healthy individuals had resulted in an improvement in lean body mass and a reduction in fat skin fold thickness after yogic practices.^[22] The short term yogic training significant decrease in LDL cholesterol and increase in HDL cholesterol.^[23] Studies on biochemical modulation in regular yoga practitioners need extensive research exposure to recommend the use of yoga as a complementary therapy.

MATERIAL AND METHOD

The study was carried out on 45 first-year MBBS, male student volunteers staying in hostel/campus. Study group comprised 45 male healthy subjects of 18-20 years. Biochemical parameters like serum cholesterol, HDL, LDL and VLDL were determined by enzymatic method, 3 ml of blood was collected in clean dry glass bottle under aseptic precautions.

Collection of blood sample & Measurement of lipid Profile

For the purpose of collection of data subjects were asked to report at early morning one day prior and one day after experimental period. From each subject 3ml of blood was obtained from an antecubital vein using a tourniquet after an overnight fasting in a clean dry glass bottle. After one hour the serum was separated by centrifugation. Total cholesterol, Triglycerides and high density lipoprotein (HDL) were carried out using the separated serum from the subjects by enzymatic method while low density lipoprotein (LDL) and very low density lipoprotein were determined by using Friedwald's equation.^[24] The enzymatic assessment was done by using biochemical assay kits prescribed for the Analyzer BA 88 of Nicholas Company.

Study group underwent yoga practices for 60 minutes twice a day in the presence of a trained yoga teacher for 24 weeks. The first observation of the group was taken before start yoga practice. Second observation was carried out after 6 month of yoga practice from the start of study. The study protocol was explained to the subjects and written consent obtained. Approval by ethical committee of S.S. Medical College, Rewa, M. P., was obtained. All the volunteers were clinically examined to rule out any systemic diseases. All subjects were non-alcoholic and non-smokers. They were not taking any drugs and they had similar dietary

habits as well as physical and mental activities at work and home. They were not practicing any known stress relieving or relaxation technique previously.

All the 45 volunteers of **study group** were trained under the guidance of a certified —yogal teacher for 15 days in the Deptt. of Physiology. They carried out —Yogasanas, Pranayama and Meditationl 60 minutes, twice a day, in morning and evening for three months, under supervision, in a prescribed manner. The schedule consisted of-

- Yogasanas- -10 minutes
- Pranayama- -10 minutes
- Meditation- -40 minutes

- *The asanas practiced were:* Ardachakrasana, Tadasana, Paschimottasana, Utthita Trikonasana, Vajrasana, Salamba Sarvangasana and Halasana.

- *The Pranayama performed was: Anulom –vilom And Ujaiyee*
- The volunteers practiced these exercises early in the morning and in evening, in a quiet, well ventilated room or in open air space sitting in a comfortable posture.

The Meditation performed was: the same, as was told by Lord Krishna to Arjun in Kuruchhetra (Method is available in Bhagvat Geeta. 9th to 16 slokes of Dhana Yoga chapter).

Collection of blood sample for biochemical parameters.

All of the **subjects of study groups** were asked to report at 9 am. Taking all aseptic precautions, 3 ml venous blood sample was drawn from the antecubital vein of each subject at first, before start yoga practice, Second blood sample was taken after 6 month of yoga practice from the start of study.

STATISTICS

The data was analyzed statistically by using statistical software Graph Pad in Stat vs. 3.10 and MS Excell (2003). Statistical analysis of serum cholesterol, HDL, LDL and VLDL level were done using student't test and $p < 0.01$ was considered as significant.

RESULTS

In study group (Table), results showed that the values of all biochemical parameters were modulated after 6 month of yoga practice as compared to basal readings, were more significantly changed ($p < 0.000$).

The effect of 03 months of yoga in study group

The value of Mean Serum cholestral. decreased from mean value 223.1 ± 14.26 mg ml % blood to 182.6 ± 18.9 mg ml % blood. ($p < 0.000$) statistically more significant & was due to the effects of regular practices of yoga.

The value of Mean Serum High density Lipoprotein (HDL) mg. % ml of blood. increased from mean value 53.92 ± 12.85 mg ml % blood to 64.56 ± 13.92 mg ml % blood. ($p < 0.000$) statistically more significant & was due to the effects of regular practices of yoga.

The value of Mean Serum Low density Lipoprotein (LDL) mg. % ml of blood. decreased from mean value 105.8 ± 20.9 mg ml % blood to 94.96 ± 19.47 mg ml % blood. ($p < 0.000$) statistically more significant & was due to the effects of regular practices of yoga.

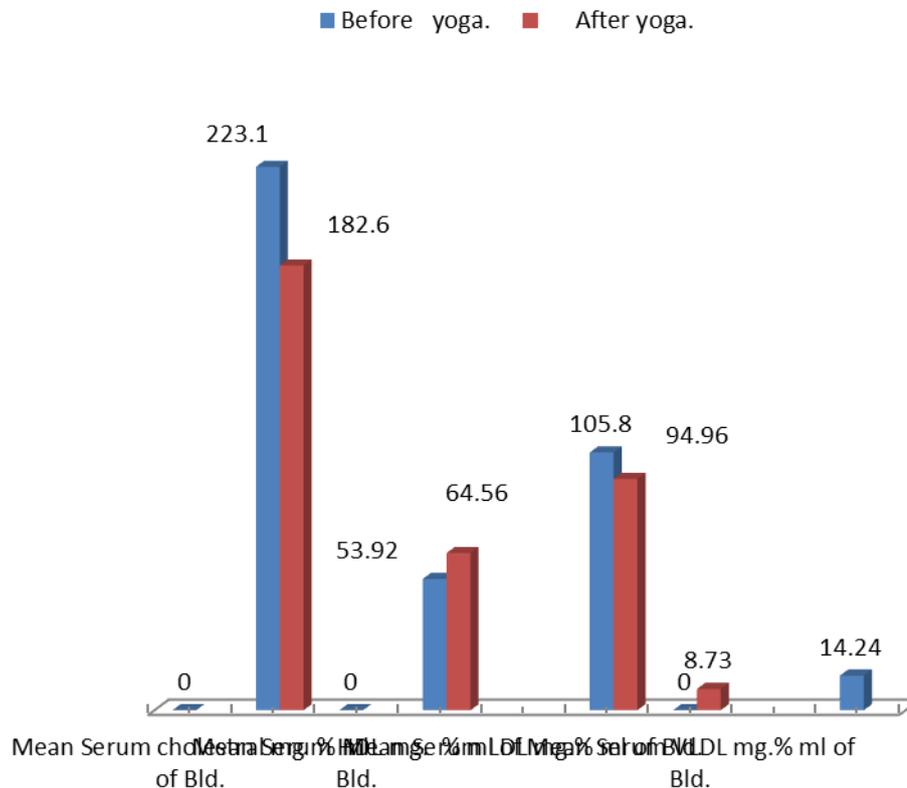
The value of Mean Serum Very Low density Lipoprotein (VLDL) mg. % ml of blood. decreased from mean value 14.24 ± 2.442 mg ml % blood to 8.73 ± 2.33 mg ml % blood. ($p < 0.000$) statistically more significant & was due to the effects of regular practices of yoga.

Observation Table

Table- showing changes in Mean Serum cholestral mg % ml of Bld., Mean Serum HDL mg. % ml of Bld. and Mean Serum LDL mg. % ml of Bld. before and after three months of yoga practices in Young healthy individuals.

S. No.	Parameters	Before yoga.	After three months of yoga.	P Value
		Mean Value S. D.	Mean Value S. D.	
1	Mean Serum cholestral mg % ml of Bld.	223.1 ± 14.26	182.6 ± 18.9	$p < 0.000$
2	Mean Serum HDL mg. % ml of Bld.	53.92 ± 12.85	64.56 ± 13.92	$p < 0.000$
3	Mean Serum LDL mg.% ml of Bld.	105.8 ± 20.9	94.96 ± 19.47	$p < 0.000$
4	Mean Serum VLDL mg.% ml of Bld.	14.24 ± 2.442	8.73 ± 2.33	$p < 0.000$

Graph showing before and after the effect of yoga on mean serum- cholestral, HDL, LDL and VLDL in young healthy medical students.



DISCUSSION

On analyzing the effect of yoga on biochemical parameters in normal healthy subjects of first-year MBBS student age group 18-20 years, in our study, the like Serum cholesterol, High density Lipoprotein (HDL), Low density Lipoprotein (LDL) and Very Low density Lipoprotein (VLDL) were studied in study group before yoga and after six months of yoga (Asana, Pranayama & Meditation).

The study group volunteers showed the effect of yoga on Serum cholesterol was decreased (<0.000), whereas High density Lipoprotein (HDL) was increased (<0.000), Low density Lipoprotein (LDL) was decreased (<0.000) and Very Low density Lipoprotein (VLDL) was decreased (<0.000) and all parameters were modulated due to regular practices of yoga. Practice of Yogasana improves biochemical profile indicating anti-stress and antioxidant effect, important in production of degenerative disorders.

The present study is in agreement with the following studies:

Karamblekar et al [1977] reported significant decrease in the LDL cholesterol and increase in the HDL cholesterol after the short term yogic training on serum cholesterol level.^[25] Aygen (1979) measured serum cholesterol levels at the beginning and end of an eleven-month period for twelve Hypercholesterolemic subjects who practiced TM. Eleven Hypercholesterolemic controls who did not practice the technique were similarly followed for thirteen months. Paired comparisons showed a significant reduction in fasting serum cholesterol levels for those subjects who practiced meditation. The cholesterol mg per 100 ml for the meditation group was 254 at the start and 225 at the end of the period, and for the control group it was 259 at the start and 254 at the end of the period.^[26]

Bagga et al [1981] studied forty female medical students who practiced yoga and reported that their average serum total cholesterol decreased from 196mg/dl to 164.7mg/dl.^[27]

Naruka, J. S., Mathur, R., and Mathur, A. in 1986 studied the effects of Pranayam practice on fasting blood glucose and serum cholesterol. There is significant decrease in triglycerides, VLDL cholesterol, LDL cholesterol and increase in HDL cholesterol.^[28]

Chitgeri and Mellikini in 1986 found decrease in the cholesterol levels in medical students undergoing yoga training for a period of 6 weeks for 1 hour daily.^[29]

Schmidt T, Wijga A, Von Zur Muhlen A, Brabant G, Wagner TOF in 1997 has studied the changes in cardiovascular risk factors and hormones during a comprehensive residential three month kriya yoga training. There is significant in body mass index and LDL cholesterol.^[30]

Mahajan AS, Reddy KS, Sachdeva U in 1999 suggested that regular practice of yoga has shown to improve serum lipid profile in the patients with known ischaemic heart disease as well as in healthy subjects.^[31]

Vyas and Dikshit in 2002 compared the lipid profile of practicing Raja yoga meditation with the non meditators. Lipid profile showed a significant lowering of serum cholesterol as compared to non meditators.^[32]

Prasad et al [2006] reported significant decrease in the total cholesterol, total triglycerides, IDL cholesterol and significant increase in the HDL cholesterol after 3 months of yogic practice.^[21]

Hence it can be inferred that Pranayama and Asanas play an important role in the modification of blood lipid profile.

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.^[15] It seems quite probable that increased physical activity leads to lowered plasma triglyceride concentrations and ultimately increased HDL cholesterol. Physical activity and HDL appear to be linked via HDLs role in triglyceride metabolism.^[34]

The effect of yogic exercise on the body mass showed a significant decrease in the fold thickness in normal volunteers at the end of the study. The present study consisting of a low intensity muscle stretches and breathing practices had show significant changes in the lipid profile. The reduction in triglycerides and increase in HDL-cholesterol could be due to hydrolysis of TG-rich lipoproteins.

The significant changes in lipid profile observed in this study might be due to the yoga practices and lecture series. It is believed that yoga brings balance between sympathetic and parasympathetic activity.^[35]

In an interventional research involving 98 subjects found fasting blood sugar (FBS), serum total cholesterol, low density lipoproteins (LDL), very low density lipoproteins (VLDL), the ratio of total cholesterol to HDL-C and total triglycerides were significantly lower and HDL-C significantly higher, on the last day of the course compared with the first day of the 8-days course.^[36]

A comparison of yoga practice with physical training showed that yoga practice for 6 months reduced fasting blood glucose, lipid levels, markers of oxidative stress, while physical training also decreased fasting blood glucose but had few of the other beneficial effects.^[37]

In a study, 44 type 2 diabetic patients were taught yoga ($n = 22$) and pranayama for three continuous months, 1 h every day in the morning by yoga expert had significant decrease in FBS, Postprandial blood sugar (PPBS), glycosylated hemoglobin (HbA1c), triglycerides and LDL of test group with $P < 0.001$, compared with control group ($n = 22$). The requirement of insulin in the yoga group was also significantly reduced.^[38]

An observational study involving long-term yoga practitioners showed that a consistent, long-term Hatha yoga practice in a nonprobability sample of women over 45 years was linearly associated with declines in BMI even after correcting for nonyogic exercise hours and processed food consumption.^[39] In a study involving 16 postmenopausal women with more than 36% body fat divided into yoga exercise group and control group, yoga group showed improved adiponectin level, serum lipids, and metabolic syndrome risk factors in obese postmenopausal women.^[40]

A retrospective study involving 15,550 adults aged 53-57 years, found that regular yoga practice for 4 years or more was associated with attenuated weight gain, especially among people who were overweight.^[41] A week of intensive yoga course reduced the BMI as well as waist and hip circumference, decreased total cholesterol, improved posture and stability.^[42]

Thus it may help in reducing stress which in turn might have brought favorable changes in lipid profile. Cholesterol rises greatly with stress. Yoga relieves the stress and there by cholesterol level is declined. Chronic sympathetic Nervous system over activity has been implicated as a factor capable of elevating and maintaining increased serum cholesterol levels independent of dietary measures. Regular practice of relaxation technique that contribute most likely through a reduction in adrenergic activity.^[19]

CONCLUSION

The Present study had demonstrated the efficacy of Pranayama and Yogasanas on lipid profile in normal healthy volunteers. Yoga practises may be helpful in lipid metabolism disorder patients.

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