

Study of therapeutic role of yoga (Hathyoga) on lipid profile in dyslipidemic individuals of Ahmedabad city

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Abnormal lipid profile is a common problem among hypertensive as well as working individuals. The rate of mortality is increasing day-by-day due to cardiovascular problems which occurs due to dyslipidemia. The aim of the present study was to assess the therapeutic role of yoga on lipid profile in Ahmedabad population. Total 50 normal healthy control and 50 individuals with dyslipidemia aged >20 years were enrolled for the present study. They were divided into two groups. Individuals in Group-1 were normal healthy, whereas individuals in Group-2 were dyslipidemics. All participants were subjected to yoga practices (Hathyogic practices - Pranayama, yoga postures and meditation) for the various intervals of 0, 3, 6, 9, and 12 months. Serum lipid profile was estimated for all individuals at different intervals. Before beginning the yoga intervention i.e., at 0 month the levels of Total Cholesterol, Total Triglycerides, LDL-cholesterol and VLDL-cholesterol were significantly high, whereas HDL-cholesterol levels were significantly low. After completion of 12 months yoga intervention a significant reduction was observed in Total Cholesterol, Total Triglycerides, LDL-cholesterol and VLDL-cholesterol as well as a significant elevation of HDL-cholesterol was observed. Yoga (Hathyoga) can be a new added adjuvant and cost effective therapy for the patients with abnormal lipid profile.

Keywords: Therapeutic approach, Yoga, lipid profile, dyslipidemic individuals, Ahmedabad

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Modern competitive, stressful and sedentary lifestyle attributes to certain common diseases such as coronary artery disease, hypertension and diabetes mellitus. Cardio Vascular Diseases (CVD), Type-II diabetes, obesity, cancer etc. are known as a Non Communicable Diseases (NCDs) which are now-a-days global burden towards morbidity and mortality.¹ Dyslipidemia and physical inactivity are well known risk factors for the onset of NCD.² The distinctive features of dyslipidemia are a high plasma triglyceride concentration, high cholesterol levels, increased concentration of low-density lipoprotein (LDL) and reduced high-density lipoprotein (HDL) concentration, which are significantly associated with coronary heart disease. Dyslipidemia can lead to Type-II diabetes mellitus³ and it initiates atherosclerotic plaque formation with alteration in endothelial cell function which results in heart disease. The alteration of lipid profile may be

important for prevention as well as control of cardiovascular diseases.⁴ Dyslipidemia, increased atherosclerosis and hypothyroidism are associated with each other.⁵ Industrial workers are more susceptible towards ill effects of air pollutants that lead to hyperlipidaemia. Hyperlipidaemia has a possible association with cardiovascular morbidity and mortality.^(6,7)

Yoga is one of the most traditional sciences, which was earlier practiced by ancient Indians for the higher purpose of gaining the higher powers known as Siddhis. Various scientific studies have been conducted on different components of yoga (Hathyoga) like pranayama (yogic breathing practices), yogasana (yogic physical postures), meditation and yoga-based relaxation techniques since last few decades. Different studies reported various health beneficial effects of yoga in many diseases like depression, anxiety, diabetes, hypertension, asthma etc^{8,9}. Prior studies on yoga reported that it helps in reducing the body mass index

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(BMI), total cholesterol and free fat mass in overweight individuals.¹⁰ It also reduces the triglycerides, improves HDL and overall well beingness. In earlier studies, yoga is found to be effective in improving the quality of life in hypothyroidism subjects.¹¹ The physiological effects of yoga practises reported that it reduces body weight gain, cholesterol levels and blood pressure along with improvement in immune function.^{12,13,14} Tundwala et al.¹⁵ (2012) reported improvement in various conditions like dyslipidemia, obesity and hypertension after practising yogasanas. In view of these observations, the present study was undertaken to assess the impact of yoga (Hathyoga) practice, at different time intervals of 3, 6, 9 and 12 months, on lipid profile in dyslipidemic individuals of Ahmedabad city.

Materials and methods

Inclusion and exclusion criteria

Inclusion criteria included non-athlete, non-smoker and non-pregnant individuals with the willingness and capability to perform different yoga exercises throughout whole year. All participants were vegetarian and consuming normal diet.

Exclusion criteria included individuals with unwillingness to do yoga course, performing various exercises and receiving medication for mental disorders, hypertension, diabetes mellitus, cardio vascular diseases etc.

Informed consent and ethical clearance:

Subjects were informed about the nature and scope of the study and written consent was obtained from them. In, present study ethical clearance was obtained from Institutional Ethical Committee.

Questionnaire: For data collection self-administered questionnaire was used. Questionnaire was provided to study subjects and they filled in the responses.

Study design and data collection: In present study total 100 individuals were included and they were divided into two groups. Out of 100, 50 normal healthy individuals were included in group-1 i.e., control group, whereas other 50 dyslipidemic individuals were included in group-2 i.e., dyslipidemic group. For the purpose of data collection, all subjects were asked to report at early morning, one day after the experimental time interval. From each subject 3 mL of blood was

obtained from an antecubital vein using a tourniquet in a clean dry glass bottle. After one hour the serum was separated by centrifugation and used for assessment of various parameters of lipid profile. Different parameters of lipid profile included Total cholesterol, total Triglycerides, high density lipoproteins (HDL), low density lipoproteins (LDL) and very low density lipoproteins (VLDL). The enzymatic assessment was done by using biochemical assay kits. The above tests were repeated at intervals of 3, 6, 9 and 12 months.

Yoga Training: All individuals were taught Hathyogic practices i.e., Pranayama, yoga postures and meditation for 3, 6, 9 and 12 months by expert yoga teacher. Detailed Hathyogic training module is described in Table 1.

Statistical analysis: The data obtained was analyzed using statistical software SPSS version 18.0. Data are represented as Mean \pm standard error. Statistical analysis of data was performed using a one way analysis of variance (ANOVA) followed by *post hoc* multiple comparison test. A p-value of <0.05 was considered as a statistical significant.

Results

In the present study, at 0 month Group-2 individuals (i.e. dyslipidemic individuals) showed significantly ($p<0.05$) higher levels of total cholesterol, total triglycerides, LDL, VLDL and lower levels of HDL when compared with control Group-1.

As the hathyogic practices progressed from 0 to 12 months, levels of total cholesterol, total triglycerides, LDL, VLDL were reduced gradually, whereas levels of HDL were increased when compared with control group-1. After 12 months mostly all the dyslipidemic individuals showed significant recovery ($p<0.05$). Total cholesterol levels, after 12 months of hathyogic practices, were significantly decreased from 240.6 to 198.1 mg/dL. After 12 months of hathyogic practices, levels of total triglycerides were decreased from 404.7 to 176.9 mg/dL. Levels of LDL and VLDL were also decreased from 167.9 to 129.8 mg/dL and from 37.5 to 32.4 mg/dL respectively, whereas after 12 months of hathyogic practices, HDL levels were increased from 29.3 to 62.5 mg/dL. Table 2 showed detailed lipid profile of all individuals.

Table 1 — Detailed hathyogic intervention module

Sequence	Intervention of Yoga	No. of rounds	Time : 60 min (1 h)	Schedule
1	Yogic prayer, Session on basic concepts of yoga and instructions for the class		05	6 days/week (MWFTTS)
2	Pranayama (voluntary regulation of breath)		15	
	➤ Omkar (Deep inhalation via nose and slow exhalation via mouth with sound “OM”),	1 each		3 days/week (MWF)
	➤ Bhramari (Deep inhalation and exhalation, with a honey bee sound),			
	➤ Kapalabhati (Forceful exhalation with passive inhalation),			
	➤ Bhastrika (Fast inhalation and fast exhalation),			
	➤ Ujjayi (Deep inhalation and exhalation with hissing sound from vocal cords),			
	➤ Chandrabhedan (left nostril breathing),			
	➤ Suryabhedan (right nostril breathing)			
	➤ Omkar (Deep inhalation via nose and slow exhalation via mouth with sound “OM”),	1 each		3 days/week (TTS)
	➤ Bhramari (Deep inhalation and exhalation, with a honey bee sound),			
	➤ Shitali/Shitakari (Deep breathing with mouth and exhale via nostrils),			
	➤ Ujjayi (Deep inhalation and exhalation with hissing sound from vocal cords),			
	➤ Anulom vilom (Deep inhalation from left nostril and exhalation via right nostril and vice versa)			
3	Flexibilities		10	
	➤ Stretching with breathing exercises for toes, tips, ankle, knee, hips, fingers, ankle stretch, rowing, churning, supine straight leg, raising, rotation, cycling, crisscross, rocking and rolling, hip stretch	1 each		3 days/week (MWF)
	➤ Wrist, elbow and neck, shoulders, hands in and out, hands stretch, forward & backward bending, side bending, twisting, lumber stretch, backstretch, tiger, stretch (spinal ups-down)	1 each		3 days/week (TTS)
4	Asanas (Yoga postures)		15	
	A) Supine postures	1 each		3 days/week (MWF)
	➤ Utthanpadasana (Raised Legs Pose),			
	➤ Naukasana (Boat posture),			
	➤ Pavanamuktasana (Gas Release Pose),			
	➤ Sarvangasana (Shoulder stand),			
	➤ Matsyasana (Fish posture),			
	➤ Halasana (Plow posture),			
	➤ Paschimottanasana (Seated Forward Bend)			
	B) Prone postures	1 each		3 days/week (MWF)
	➤ Bhujangasana (Cobra posture)			
	➤ Ardha Shalabhasana (Alternate leg Grasshopper posture)			
	➤ Shalabhasana (Grasshopper posture)			
	➤ Ardha Dhanurasana (Alternate leg Bow posture)			
	➤ Dhanurasana (Bow posture)			
	➤ Urdhva Naukasana,			
	➤ Chakrasana			

(contd.)

Table 1 — Detailed hathyogic intervention module (contd.)

C) Sitting postures		1 each	3 days/week (TTS)
➤	Vajrasana (Diamond posture)		
➤	Shasahankasana (Rabbit posture)		
➤	Supta vajrasana (Sleeping diamond posture)		
➤	Ustrasana (Camel posture)		
➤	Vakrasana (Spinal twist posture)		
➤	Ardha matsyendrasana (Spinal twist posture)		
➤	Gomukhasana (Cow face posture)		
➤	Padmasana (Lotus posture)		
D) Standing postures		1 each	3 days/week (TTS)
➤	Tadasana (Basic standing posture)		
➤	Ardhakati Chakrasana (Half waist rotation posture)		
➤	Padahasthasana (Foot palm posture)		
➤	Ardha chakrasana (Half wheel posture)		
➤	Trikonasana (Triangle posture)		
➤	Virabhadrasana (Warrior posture)		
➤	Vrikshasana (Tree posture)		
➤	Garudasana (Eagle posture)		
5	Sun salutation (Suryanamaskar)	6	10 mins 6 days/week (MWF)
6	Meditation		5 mins 6 days/week (TTS)
*MWF Monday, Wednesday and Friday TTS Tuesday, Thursday and Saturday			

Table 2 — Comparison of lipid profile in control and dyslipidemic individuals at different time intervals

Lipid Profile (mg/dl)	Group-1 (Control)		Group-2 (Dyslipidemic individuals)					Pearson correlation (R)
	(Mean ± S.E.)		Different time intervals (Mean ± S.E.)					
			0 month	3 months	6 months	9 months	12 months	
Total cholesterol	191.8 ± 0.31	240.6 ± 1.22*	233.8 ± 1.44*	221.3 ± 1.21*	210.5 ± 1.02*	198.1 ± 0.48 ^{NS(#)}	0.9959	
Total triglycerides	170.1 ± 0.18	404.7 ± 0.86*	362.2 ± 2.60*	296.4 ± 1.98*	228.9 ± 1.61*	176.9 ± 1.48 ^{NS(#)}	0.9974	
LDL cholesterol	123.1 ± 0.16	167.9 ± 0.65*	158.9 ± 0.94*	149.6 ± 0.63*	140.9 ± 0.70*	129.8 ± 0.35 ^{NS(#)}	0.9991	
HDL cholesterol	65.3 ± 0.21	29.3 ± 0.39*	36.5 ± 0.43*	44.3 ± 0.37*	55.3 ± 0.40*	62.5 ± 0.24 ^{NS(#)}	0.9973	
VLDL cholesterol	29.9 ± 0.17	37.5 ± 0.43*	36.2 ± 0.41*	35.3 ± 0.41*	34.1 ± 0.39*	32.4 ± 0.38 ^{NS(#)}	0.9944	
Total lipids	683.6 ± 0.26	726.7 ± 0.98*	718.1 ± 0.89*	707.3 ± 0.91*	699.2 ± 0.90*	689.2 ± 0.97 ^{NS(#)}	0.9993	

Values are mean ± S.E

S.E. = Standard Error, NS = Non Significant,

LDL = Low Density Lipoprotein, HDL = High Density Lipoprotein, VLDL = Very Low Density Lipoprotein,

*p < 0.05 (when compared with control-group 1), #p < 0.05 (when compared with values of dyslipidemic individuals at 0 month).

correlation coefficient(r): Total cholesterol vs Total triglycerides= 0.998; Total cholesterol vs LDL= 0.997; Total cholesterol vs HDL= 0.992; Total cholesterol vs VLDL= 0.992; Total cholesterol vs Total lipids= 0.996.

Discussion

The present study was intended to study the effect of various hathyogic practices on dyslipidemic individuals. Present study demonstrated significant improvement in lipid profile after hathyogic practices. Devi et al¹⁶, (2016) reported that yoga training

improved lipid profile as well as autonomic functions in hypertensive patients, which is in support of our data. Another study concluded that yoga practices significantly elevated S.HDL cholesterol and reduced S. Total Cholesterol, TGs, LDL and VLDL Cholesterol in both men and women¹⁷. Acharya et al¹⁸.

(2010) reported significant decrease in TC, TG, LDL and VLDL and significant increase in HDL levels after yoga practices in footballers which is in corroboration with the present study. Positive recovery in the lipid profile after yoga practices may be due to elevated hepatic enzymes at cellular level, which affects the metabolism of lipoprotein and boosts triglycerides uptake by adipose tissues^{19,20}. Rajayoga meditation showed significant decrease in total cholesterol and TG levels whereas increase in HDL levels as observed in present study²¹. Almost all nucleated cells synthesize cholesterol, but only liver cells have capability to efficiently metabolize and excrete cholesterol from the body. The main route of cholesterol purge is by excretion into the bile, either directly or indirectly i.e., after conversion to bile acids. Cholesterol is transported from the plasma membranes of peripheral cells to the liver by an HDL-mediated process termed reverse cholesterol transport²². Thus, HDL plays an important role in reducing cholesterol levels in the blood. After 90 days of yoga practices, hypertensive patients showed significant reduction in levels of Serum total cholesterol, Serum triglyceride and Serum LDL cholesterol, but levels of Serum HDL-cholesterol were significantly induced as documented in present study²³. In corroboration of our data, yoga regimen (Pranayamas and yogasanas) proved to be beneficial in improving lipid profile in patients with Type-II diabetes²⁴. Maini *et al.*²⁵. documented significant reduction in cholesterol levels and elevation in HDL levels in individuals practising Rajayoga meditation which supports our observations in this study.

Conclusion

The present study concludes that hathyoga (Pranayama, yoga postures and meditation) is a very effective and non-pharmacological technique of treating blood dyslipidemia and it can precisely regulate lipid metabolism.

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