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Influence of Yoga and Physical Training on HDL-C among Type 2 Diabetic Patients

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Abstract:

Diabetes has become a major health challenge worldwide. In India the prevalence of diabetes is rising rapidly, especially in the urban population because of increasing obesity and reduced physical activity. The purpose of this study was to investigate the effects of yoga and physical training on HDL cholesterol among type 2 diabetes patients. Thirty type-2 male diabetic patients (n = 30) from one Medical College Hospital were randomly selected as subjects. The age of the subjects ranged from 35 to 50 years. The subjects divided into three equal groups of ten subjects each (n = 10). In which, group I underwent yogic exercises (YG), group II underwent physical activities (PTG) for six days per week for sixteen weeks and group III acted as control (CG) who did not undergo any special training programme apart from their regular activities. HDL cholesterol was selected as a test variable and assessed before and after the training period. The collected data were statistically analysed by using Analysis of Covariance (ANCOVA) and Scheffe's test was applied as a post hoc test to determine the paired mean difference. From the results of the study, it was found that there was a significant improvement ($p \leq 0.05$) in

HDL cholesterol level of training groups when compared to control group.

Key words: Yoga, physical training, HDL cholesterol, type2 diabetes

Introduction

Diabetes is a metabolic disorder, which has become a major health challenge worldwide. The unprecedented economic development and rapid urbanization in Asian countries, particularly India has led to shift in health problems from communicable to noncommunicable diseases (Mohan *et al*, 2001). Yoga is one of the orthodox systems of Indian philosophy. It was collated, coordinated and systematized by patanjali in his classical work, the yoga sutras, which consists of 185 terse aphorisms. The system of yoga is called because it teaches the means by which the jivatma can be united to, or be in communion with the paramathma, and so secure liberation (moksa). Yoga is a complete science of life that originated in India many thousands of years ago. It is the oldest system of personal development in the world, encompassing body, mind and spirit. As a particular form of physical activity, yoga programs using various physical postures have been shown to benefit individuals with a wide range of health conditions including diabetes. Yoga is an ancient art based on a harmonizing system of development for the body, mind, and spirit. The continued practice of yoga will lead you to a sense of peace and well-being, and also a feeling of being at one with their environment. The practice of yoga makes the body strong and flexible; it also improves the functioning of the respiratory, circulatory, digestive, and hormonal systems. Yoga brings about emotional stability and clarity of mind (Devananda, 2000).

The beneficial effects of physical activity typically include reductions in glucose level and body weight (USDHHS, 2004). As a particular form of physical activity, yoga programs

using various physical postures have been shown to benefit individuals with a wide range of health conditions including diabetes (Bijlani *et al*, 2005). Frequent and regular physical exercise boosts the immune system, and helps prevent diseases of affluence such as heart disease, cardiovascular disease. Systematic physical activity develops and maintains physical fitness and overall health. It is often practiced to strengthen muscles and the cardiovascular system, and to improve athletic skills. Frequent and regular physical exercise boosts the immune system, and helps prevent diseases of affluence such as heart disease, cardiovascular disease (Ronald *et al*., 2004). One important regimen for people with diabetes and for those at risk for developing diabetes is engaging in appropriate physical activity.

Cholesterol is a fat-like substance used to help build cell membranes, make some hormones, synthesize vitamin D, and form bile secretions that aid for digestion. Lipoproteins are transport vehicles in the circulating plasma that are composed of various lipids such as cholesterol, phospholipids, triglycerides and proteins known as apoproteins (Kravitz & Heyward, 1993). HDL-C has an inverse relationship with coronary heart disease, offering a protecting mechanism against the development of CHD (Kannel *et al*., 1983). HDL-C is considered to be the most powerful lipid parameter for predicting CHD in people of all ages (Gordon *et al*., 1977). The primary function of HDL-C is to transport cholesterol from the tissues and blood to the liver for excretion from the body or synthesis into bile acids. Physical exercise increases the level of the "good" HDL cholesterol in the bloodstream, which helps carry the cholesterol out of the arteries. Exercise improves lipid profile and decreases CHD risk. Leon and Sanchez (2001) suggested that higher HDL cholesterol levels are associated with a lower risk of heart disease, and that low HDL cholesterol levels are associated with an increased risk of heart disease. This study has

attempted to find out the effects of yoga and physical training on HDL cholesterol among type 2 diabetic patients.

Materials and methods

For this purpose only type-2 male diabetes patients from Rajah Muthiah Medical College and Hospital, Annamalai University, India was randomly selected as subjects. Their age were ranged between 35 and 50 years. The selected thirty subjects were divided into three groups of ten each. Out of which, group I (n = 10) underwent yogic practices, group II (n = 10) underwent physical exercises and group III (n = 10) remained as a control. The training programme was carried out for six days per week during morning session only (6 am to 8 am) for sixteen weeks. HDL cholesterol was selected as criterion variable for this study and it was assessed by cholesterol oxidase enzymatic method using Boehringer Mannheim Kit. Both experimental groups initially performed thorough warming up exercises. After that group I performed the following yoga exercises. These are the exercises were given, padmasan, bhujangasan, halasan, vajrasan, eka padhasan, parivatasan, oorthavamuga bhujangasan, dhanurasana, shasangasan, veerabhadhrasan, vakhrasan, patchimoththanasan, shalabhasan, trikonasan and padhahasthasan with moderate intensity. Group II performed calisthenics, stretching, sit-ups, pushups and medicine ball exercise with moderate intensity.

Data Analysis

Mean and standard deviation were calculated for HDL cholesterol for each group. And the data were analyzed by using analysis of covariance (ANCOVA). If the 'F' value was found to be significant for adjusted post-test mean, Scheffe's test was used as a post hoc test to determine the significant difference

between the paired mean. Statistical significance was set to priority at 0.05 levels.

Results

Table I. Analysis of covariance for HDL - c of experimental groups and control group

Test		YG	PTG	CG	SOV	SS	df	MS	*F*
Pre test	Mean	41.02	40.99	40.41	B	2.37	2	1.18	0.13
	S.D.	2.75	3.33	3.0	W	249.17	27	9.23	
Post test	Mean	47.24	48.22	40.46	B	357.16	2	178.58	18.31*
	S.D.	3.22	3.12	3.02	W	263.38	27	9.76	
Adjusted Post test	Mean	47.16	48.16	40.60	B	333.97	2	166.98	18.72*
					W	231.87	26	8.92	

*Significant F = (df 2, 27) (0.05) = 3.35; ($p \leq 0.05$) F = (df 2, 26) (0.05) = 3.37; ($p \leq 0.05$)

The table I showed that the pre test mean values on HDL cholesterol in the yoga group, the physical training group and control group were 41.02, 40.99 and 40.41 respectively. The obtained *F* ratio of 0.13 for pre test which was lower than the required table value 3.35 with df 2 and 27 at 0.05 level of confidence. The post test mean values for yoga group physical training group and the control group were 47.24, 48.16 and 40.46 respectively. The obtained *F* ratio of 18.31 for post test which was higher than the required table value 3.35 with df 2 and 27 at 0.05 level of confidence. The adjusted post test mean values on HDL cholesterol in yoga group physical training group and the control group were 47.16, 48.16 and 40.60 respectively. The obtained *F* ratio of 18.72 for adjusted post test which was higher than the required table value 3.37 with df 2 and 26 for significance at the 0.05 level of confidence on HDL cholesterol.

Hence, the results of the study showed that there was a significance difference exists between yoga group, physical training group and control group on HDL cholesterol. Further to determine which of the paired means has a significant

improvement, Scheffĕ's test was applied as a post - hoc test. The result of the follow up test was presented in Table II.

Table II. Scheffe's post hoc test for mean difference between groups of HDL - c

YG	PTG	CG	MD	*CI*
47.16	48.16		1.0	
47.16		40.60	6.56*	3.47
	48.16	40.60	7.56*	

*Significant, $p \leq 0.05$

Table II showed that the adjusted post test mean difference in HDL cholesterol between yoga group and control group and physical training group and control group are 6.56 and 7.56 respectively. These values are higher than the required confidence interval value of 3.47, which shows significant difference at the 0.05 level of confidence. The results of the study showed that there was a significant difference between experimental groups and control group. It also showed that there was an insignificant difference between two experimental groups. The pre, post and adjusted post test mean values of experimental groups and control group on HDL cholesterol was graphically represented in the figure 1.

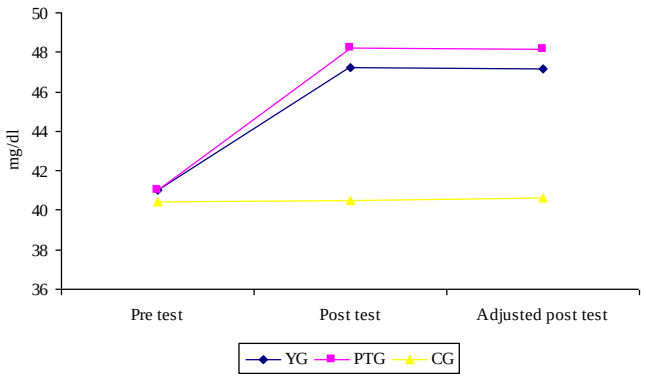

Figure 1: The pre, post and adjusted post test mean values of experimental groups and control group on HDL cholesterol

Discussion

This study investigated to implementing a yoga programme and physical training among adults at high risk for type 2 diabetes. The results indicated that the yoga program and physical activity are feasible and acceptable to the population. Certain yoga asanas, if practiced regularly, are known to have beneficial effects on the human body. Many research studies reported that a yoga programme significantly increased HDL cholesterol in patients with type 2 diabetes mellitus (Singh *et al*., 2001 and Aljasir *et al*., 2010). Malhotra reported significant improvement in glycemic control and lipid profile in type 2 diabetic patients exposed to yoga exercise where there was significant improvement in HDL concentrations (Malhotra *et al*., 2005). Mercuri *et al*. (2003) reported significant improvement in HDL concentrations within three months of yoga exercise in type 2 diabetic patients. Innes *et al*. (2007) clearly indicated that continuous yogasana practice increase good cholesterol levels and it helps to reduce the diabetics. Evidence for the benefits of physical activity includes its effects shown to increase the high-density lipoprotein (HDL) (Scheers *et al*., 2008 and Eble *et al*., 2009). Many previous studies have shown exercise is beneficial and increases HDL (Dimitriou *et al.,* 2007 and Wing *et al*, 2004) in men. Mackinnon and Hubinger, (1999), concluded that exercise training increase the level of HDL-C in the blood. Thirty minutes per day of exercise, like jogging, has sustained beneficial effects on HDL metabolism. No previous studies have attempted to compare the responses of HDL cholesterol to yoga programme and physical exercise in male diabetic patients. Therefore, the present study was designed to determine the yogi and physical training on HDL cholesterol of type-2 male diabetic patients.

Conclusion

These studies have confirmed the useful role of yoga and physical training in the control of diabetes mellitus. High density lipoprotein cholesterol level increased significantly. There was a lowering of drug requirement and the incidence of acute complications like infection and catharsis was significantly reduced. Prevailing evidence supports the concept that yoga exercise and physical activity can help to increase the HDL level among type -2 diabetic patients. In summary, the results of this study suggest that a yoga program and physical training could potentially be at risk reduction option for adults at high risk for type 2 diabetes. The result of the study indicated that there was significant improvement in HDL levels of male type -2 diabetic patients due to sixteen weeks of yoga and physical training.

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