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Effects of yoga on the lipid profile of diabetic patients at risk of heart disease

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Abstract

The present study was aimed at studying the effect of practicing yoga in patients with type 2 DM for 4 months. The practice of yoga in these patients resulted in a decrease in body weight, total cholesterol, triglycerides and LDL cholesterol and an increase in HDL. Yoga based programs are a low-cost intervention strategy to improve physical and psychological well-being. Rhythmic extension and bending in yoga provides stimulation to organs and glands without straining the muscles. Yoga could be also useful in patient suffering from insulin resistance syndrome.

Keywords- Yoga Therapy, Diabetes Mellitus, Lipid Profile, Cardiovascular Risk, HbA1c Control, Triglycerides Reduction, Lifestyle Intervention, Cholesterol Management

Introduction

Diabetes causes an imbalance in the lipid profile. This disorder is also known as dyslipidaemia. This disorder is a major risk factor for cardiovascular disease. Diabetics are characterized by high plasma triglyceride concentrations, low high-density lipoprotein (HDL) concentrations, and increased concentrations of small, dense low-density lipoprotein (LDL) particles. Insulin resistance due to diabetes increases the flow of free fatty acids and results in lipid changes. The National Health and Nutrition Examination Survey (NHANES) 2000 reports that approximately 55% of the general US population and 50% of adults aged 20 to 55 with diabetes have hypercholesterolemia. I don't know the statistics for India. But the situation in India is no less than reports from prosperous countries like the United States.

Diabetes impairs digestion. Calorie restriction and weight loss have proven clinically beneficial for overweight individuals who develop obesity due to digestive imbalances. However, there is no consensus on the ideal dietary composition for these patients, as it is difficult to reach a consensus among scholars in this field. Genetic factors and an individual's lipid phenotype have been shown to determine the pattern of changes in plasma lipid profiles in these patients. However, lifestyle modifications, including increased yogic physical activity and yogic dietary modifications, have been the cornerstone of managing dyslipidemia in diabetes.

In a review of an earlier study, we conducted a study on subjects with mild to moderate hypertension and found that yogic practices and yogic dietary practices may play a significant role in cardiovascular disease risk modification. Another scholarly study reported improved lipid profiles in long- and medium-term meditators compared to non-meditators. In light of such diverse observations, we conducted the current study to assess the effect of yoga practice on lipid profiles in diabetic patients. As I have written previously, the hallmarks of diabetic dyslipidemia, which carries a risk factor for cardiovascular disease, are high plasma triglyceride concentrations, low high-density lipoprotein (HDL) concentrations, and increased concentrations of small, dense low-density lipoprotein (LDL) particles. Insulin resistance increases the circulating free fatty acids and results in lipid changes.2.

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Objective

The present study was conducted to assess the effectiveness of yoga in preventing heart disease in diabetic patients who are at risk of heart disease due to cholesterol.

Methods

This randomized parallel study was conducted in the Bikaner region of Rajasthan. Type 2 diabetic patients at risk for heart disease were randomly divided into control and yoga groups. The control group received allopathic medication for their respective disease. The yoga group practiced yoga for 45 minutes daily for 4 months while also taking allopathic medication for their disease. The lipid profiles of both groups were compared at the beginning and end of the 4 months. Results

After intervention with yoga for a period of 3 months the study group showed a decrease in total cholesterol, triglycerides and LDL, with an improvement in HDL.

Conclusion

Yoga is not only an Indian spiritual way of life, but it is also a complete medical practice today. Through yoga, elevated lipid levels in diabetic patients can be controlled.

. Introduction

Materials and methods

Setting

In 2020, in the Bikaner area of Rajasthan, patients interested in attending my regular yoga classes and reporting regularly to the diabetes clinic participated in this randomized parallel study. Our yoga institute aims to promote lifestyle changes in patients suffering from non-communicable diseases and conducts regular yoga classes for all our yoga practitioners. This study was conducted after obtaining permission from the patients and their relatives, and all participants volunteered for the trial.

Study sample

I used our National Diabetes Data Group's guidelines, regulations, and code of ethics and the National Cholesterol Education Program (NCEP ATP III) Adult Treatment Panel to recruit 50 patients with diabetes and dyslipidaemia. Participants and known diabetics who were receiving treatment with sulfonylureas were included in the study. Patients who drank alcohol, smoked, were taking long-term steroids, were pregnant, and had known coronary artery disease, retinopathy, nephropathy, or cerebrovascular disease were excluded.

The 50 patients with type 2 diabetes attending the diabetes clinic were randomly divided into a control group of 14 men and 11 women and an experimental group of 12 men and 13 women.

Methodology

All the Yaugik activities shown in Table 1 below were practiced.

Table 1

Yog Asanas (body postures in Hatha yog)
Suryanamaskara (sun salutation)
Yoga Mudrasana (psychic union pose)

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Vajrasana (thunderbolt pose)

Vakrasana (twisted pose)

Paschimottasana (seated forward bend)

Pavanamuktasana (wind relieving pose)

Sashankasana (hare pose)

Ushtrasana (camel pose)

Bhujangasan (cobra pose)

Dhanurasana (bow pose)

Ardhakatichakrasana (lateral arc pose)

Parivritta trilokasanaan (revolved triangle pose)

Shavasana (corpse pose)

Pranayama (breathing exercises)

Ujjayi pranayama

Anuloma viloma

Alternate Kapalapathi pranayama

Suryabhedha pranayama

Meditation

Vipasshana meditation

Breath counting meditation

Thought counting meditation

The BMI, W/H circumference and lipid profile of all the participants were measured at the end of 4 months. Data were entered in computer for analysis. Paired and unpaired *t* tests were employed to compare measures. A *p* value of <0.05 as significant and a *p* value of <0.01 was considered highly significant.

3. Results

A total of 50 type 2 diabetic patients, 26 males and 24 females of mean age 46 years participated in the study. The average duration of diabetes in the participants was 7 to 10 years. Both the groups were similar in respect to mean age, sex, weight, BMI, W/H ratio, glycaemic control, Serum triglycerides and HDL levels. The total

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cholesterol and LDL levels were, however, significantly higher in the experimental group compared to control group see in Table 2.

Table 2. Baseline characteristics of the participants.

Parameters	**Control group**	**Study group**
	(Medication only) *n* = 25	**(Medication + Yogic intervention) *n* = 25**
Mean age (years)	44.46 ± 10.98	45.51 ± 7.98
Sex (M/F)	11 F, 14 M	13 F, 12 M
Wt (kg)	62.20 ± 4.45	62.17 ± 4.67
BMI (kg/m^2)	23.2 ± 2.14	22.9 ± 2.15
W/H ratio	0.93 + 0.07	0.94 + 0.07
FBS (mg/dl)	181.57 ± 66.25	155.86 ± 60.53
PPBS (mg/dl)	265.31 ± 74.70	240.31 ± 79.42
Total cholesterol (mg/dl)	225.74 ± 37.60	244.86 ± 28.09*
Triglyceride (mg/dl)	172.74 ± 52.55	151.89 ± 43.08
LDL cholesterol (mg/dl)	126.11 ± 30.41	144.74 ± 28.46*
HDL cholesterol (mg/dl)	44.23 ± 5.21	44.63 ± 9.35

*$p < 0.05$.

The study showed that 4 months of yoga practice resulted in a non-significant decrease in BMI from 25.12 ± 1.54 to 23.59 ± 1.38 kg/m^2. A significant decrease in the weight from 62.20 ± 4.45 to 59.60 ± 4.65 kg and W/H ratio from 0.94 + 0.07 to 0.89 + 0.07 was recorded.

There was a significant reduction in total cholesterol, triglycerides and LDL cholesterol. Mean total cholesterol before yoga was 244.86 ± 28.09 mg% and was reduced to a mean of 219.56 ± 32.02 mg%. Triglycerides showed a significant reduction from 151.88 ± 43.08 mg% to 130.11 ± 28.82 mg% while the LDL reduced from 144.74 ± 28.45 to 120.51 ± 34.31 mg%. There was a non-significant elevation in HDL from 44.63 ± 9.35 mg% to 47.15 ± 8.17 mg % See in Table 3.

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Table 3. Comparison of pre-yoga and post-yoga values in experimental group.

Parameters *n* = 50	**Pre-yoga (mean ± SD)**	**Post-yoga (mean ± SD)**
WT(kg)	62.20 ± 4.45	59.60 ± 4.65*
BMI (kg/m^2)	25.12 ± 1.54	23.59 ± 1.38
W/H ratio	0.94 + 0.07	0.89 + 0.07*
Total cholesterol (mg/dl)	244.86 ± 28.09	219.54 ± 32.02**
Triglycerides (mg/dl)	151.88 ± 43.08	130.11 ± 28.82*
LDL cholesterol (mg/dl)	144.74 ± 28.45	120.51 ± 34.31**
HDL cholesterol (mg/dl)	44.63 ± 9.35	47.15 ± 8.17

*$p < 0.05$, **$p < 0.01$.

After a period of 3 months the control group showed a significant increase in body weight, non-significant increase in BMI, total cholesterol, triglycerides and LDL and a decrease in HDL (Table 4).

Table 4. Comparison of initial values of parameters and follow up values of the control group.

Parameters *n* = 50	**Initial value (mean ± SD)**	**Follow up (mean ± SD)**
WT (kg)	62.17 ± 4.67	63.03 ± 5.10*
BMI (kg/m^2)	24.73 ± 1.87	25.03 ± 2.14
W/H ratio	0.93 + 0.07	0.91 + 0.05
Total cholesterol (mg/dl)	225.74 ± 37.60	235.23 ± 26.64
Triglycerides (mg/dl)	172.74 ± 52.55	197.91 ± 130.11
LDL cholesterol (mg/dl)	126.11 ± 30.41	126.60 ± 22.84
HDL cholesterol (mg/dl)	44.23 ± 5.21	43.13 ± 12.33

*$p < 0.05$.

4. Discussion

The aim of the present study was to study the effects of three months of yoga practice on diabetic patients. Yoga practice in these patients resulted in reductions in BMI, body weight, weight/age ratio, total cholesterol, triglycerides, and LDL cholesterol, and increases in HDL.

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Improving glycemic control has not yet been proven to prevent the development of macrovascular complications in diabetes. Alternatively, carefully controlled treatment measures with exercise, dietary modifications, and oral medications may be expected to improve diabetic lipid disorders.

The effect of exercise on blood lipid profiles has been widely reported. Physical activity increases HDL levels and reduces concentrations of very low-density lipoprotein cholesterol and triglycerides. Physical activity and HDL appear to be linked through HDL's role in triglyceride metabolism.

However, it has been observed that diabetic patients are generally unable to maintain recommended physical activity levels due to various reasons such as age, obesity, cardiovascular disease, and other complications. Compliance and motivation to regularly engage in activity at 50–70% of maximum aerobic capacity are significantly poor.

Yoga has beneficial effects on insulin dynamics and the resulting lipid profile. The reduction in waist-hip ratio in this study is consistent with that reported by Sahay et al., who also reported an increase in lean body mass and a decrease in skinfold thickness. Yoga helps redistribute body fat and reduce central obesity, which causes insulin resistance. A reduction in insulin resistance, increased insulin receptors and sensitivity, and a leftward shift of peak insulin levels, along with normalization of the insulin-glucagon ratio, were also reported.

Dynamic stretching of the body during yoga asanas is believed to rejuvenate pancreatic cells, increase insulin secretion, and thus potentially correct impaired insulin secretion in chronic diabetes.21

Various studies have reported physiological, somatic, psychological, and endocrine changes associated with yoga practice. Manchanda and Narang found that after one year of yoga therapy, patients with coronary artery disease (CAD) experienced significant reductions in serum total cholesterol, triglycerides, and LDL cholesterol. Patients experienced a significant reduction in the number of angina episodes and fewer required revascularization procedures. Angiography showed improvement in lesions after one year. Vyas found that practicing Raja Yoga meditation reduced serum cholesterol, while Sahay and Bijlani found that yoga practice significantly reduced free fatty acids, LDL, and VLDL, and increased HDL.

The beneficial effects of yoga in the management of hyperlipidemia and obesity cannot be attributed solely to additional calorie expenditure because yoga does not involve intense muscle activity and energy production. Repeated stress causes persistently elevated cortisol levels, leading to central obesity and insulin resistance.25 This increases gluconeogenesis and reduces peripheral glucose absorption. Stress-induced secretion of growth hormone and β-endorphin may also lead to decreased glucose absorption and insulin secretion. Elevated cortisol is also associated with dyslipidemia and hypertension. Yoga has been shown to decrease sympathetic hormone levels and lower cortisol. Pranayama reduces sympathetic tone, enhances parasympathetic activity, and helps individuals reduce stress. Meditation also induces a hypometabolic state and reduces stress-induced sympathetic hyperactivity. Improved ability to cope with stress, resulting in lower cortisol levels, may be cited as a possible mechanism for improved lipid profiles in patients practicing yoga. Dyslipidemia is typically associated with abnormalities in lipolysis; triglyceride metabolism and free fatty acid turnover in the case of insulin resistance. Impaired lipoprotein lipase and increased hepatic lipase activity are thought to be a consequence of insulin resistance in diabetes. Chronic exposure to elevated free fatty acids is associated with impaired insulin secretion. Improvements in lipid profiles from yoga practice may be due to increased hepatic lipase and lipoprotein lipase. This would increase the absorption of triglycerides by adipose tissue and impact lipoprotein metabolism.

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Yoga practice also impacts a person's mental balance, reducing anxiety and stress and leading to hormonal balance and feelings of well-being. This feeling of well-being is due to its ability to increase endogenous melatonin secretion. This increases the likelihood of long-term adherence to its practice and could be used as an effective intervention in disease control.

5. **Conclusions**

The current study successfully demonstrated the efficacy of a yogic diet and its role in improving dyslipidemia, a condition associated with diabetes and cardiovascular disease. A lifestyle that includes appropriate yogic diet, behavior, yoga, exercise, and stress management training, targeting elevated lipids through an integrated approach, results in improved lipid profiles, normal BMI, and reduced macrovascular complications in diabetes.

5.1. **Strengths of the Study**

The yoga protocol was developed by some of the author's yoga expert friends after an extensive literature review, based on a classical approach, and was an ideal combination of yoga asanas and pranayama exercises targeted for the diabetes patient under study. Patients were given special attention and were motivated to practice their prescribed yoga. The study sample had excellent adherence and no dropouts. Patients in the experimental group voluntarily reported to the holistic medicine department and were self-motivated to practice yoga. The control group was also under constant monitoring by the diabetes care clinic.

5.2. **Study Limitations**

Direct observation of patients was not possible for the entire duration of the study. Information on the appropriate compound diet was provided, but dietary data was not recorded. Despite the motivating environment and consistent information, a long-term study was not possible due to the risk of non-compliance among some patients.

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