

INFLUENCE OF YOGIC TREATMENT ON QUALITY OF LIFE OUTCOMES, GLYCEMIC CONTROL AND RISK FACTORS IN DIABETES MELLITUS

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ABSTRACT

The aim of the study was to evaluate the effect of yoga intervention in achieving glycemic control, improving various risk factors like BMI, Waist-Hip Ratio, Lipid Profile along with quality of life in diabetes mellitus. This randomized controlled study was conducted in 200 diabetic patients out of which 154 completed the study (group 1-controls- n=72 and group 2 -yoga group- n=82). They were put on user friendly yoga program consisting of diet control, moderate aerobic, health rejuvenating, relaxation exercises, stress management and meditation. The data analysis of various variables was done using SPSS version, Chi square test and Student's "t" test.

At base line both the groups were similar in anthropometric and clinical variables. At the end of 3 months, the yoga group showed significant improvement in glycemic control i.e. mean fall in HbA_{1c} (0.79 vs 0.32%, p<0.005), Fasting blood glucose (33.25 vs 1.18, p<0.0001), BMI (1.38 vs 0.43, p<0.001), W/H ratio (0.05 vs 0.02, p<0.028) improvement in quality of life, satisfaction score (17.04 vs 1.46, p<0.0001) impact score (p<0.0001) and worry score (p<0.001). There was also improvement in lipid profile, total cholesterol (mean change 29.61 vs 10.44, p<0.0005), triglycerides (mean change 27.98 vs 2.06, p<0.00001), HDL (mean change -11.49 vs -1.89, p<0.0001), LDL (mean change 28.90 vs 6.63, p<0.0078) and VLDL (mean change 5.60 vs 1.64, p<0.001). There was also improvement in blood pressure along with significant reduction in doses of OHA and Insulin. We conclude that adjunctive use of yoga life style intervention improves glycemic control and quality of life along with favorable effect on various risk factors.

KEYWORDS: Type 2 diabetes; Alternative therapy; Diabetes and yoga; Diabetes quality of life questionnaire.

INTRODUCTION

Diabetes affects approximately 300 million people

throughout the world and is on an increasing trend because of change in life style, with excessive calorie intake, reduced physical activity and increased stress. Obesity is the most common nutritional disease in developed countries (1). It is often associated with type 2 diabetes mellitus which increases the mortality rate. However, the death rate can be reduced by proper management of obesity (2). Obesity is particularly responsible for insulin resistance and glucose intolerance (3). Regular exercise and physical training can enhance insulin sensitivity (4). Poor glycemic control is associated with higher levels of stress in both adolescents (5) as well as in adults (6).

Different studies have clearly demonstrated that the changes in life style chiefly dietary modification, physical exercise and stress relaxation have an important role in the management of diabetes. Exercise training increases the proportion of insulin sensitive fibers in muscle as also increases fat oxidative enzyme activity, and both these changes favor the utilization of fat as the fuel. Physical training increases muscle GLUT-4 content (7) and insulin sensitivity in subject with type 2 diabetes mellitus and HbA_{1c} may fall by 1.0-1.5% after 6 weeks of training (8).

Cross sectional and prospective data suggest that regular exercise can reduce the probability of development of type 2 diabetes mellitus. Population studies have clearly demonstrated that the glucose tolerance is better in physically active persons than in inactive persons (9).

Joslin medal displays a troika with three horses (diet, exercise and insulin) as the major means of diabetic control but unfortunately more emphasis is directed towards the use of drugs, however the diet and exercise are equally important and cost effective. Yoga has always been an essential part of life in traditional system of treatment, so we have tried to elucidate the influence of yoga in diabetic patients with specific aims and objectives. The present study

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was designed to assess the effects of strict but “user friendly” intervention using yoga life style methods (which include yogic exercises, dietary management, moderate aerobic exercise and stress management) in achieving glycemic control and improvement in various risk factors like BMI, W/H ratio, lipid profile along with quality of life in diabetic patients.

MATERIAL AND METHODS

This prospective randomized case control study was conducted in associated group of hospitals, attached to Sardar Patel Medical College, Bikaner in North West Rajasthan, India.

200 patients were randomly selected from diabetic clinic, out of which 154 completed the study (group-1 n=72 and group-2 (yoga group) n=82). 46 patients were excluded due to non compliance with treatment or had complications viz IHD, infection and refusal to participate. Patients suffering from disorders like liver disease, pulmonary tuberculosis, malabsorption, thyrotoxicosis, alcoholism, and non-cooperative patients were excluded from the study. Approval from ethical committee and consent from patients were taken before starting the protocol.

Baseline parameters – BMI, W/H ratio, fundus, fasting blood glucose, glycosylated hemoglobin, lipid profile, renal functional test, neurological examination, diabetes quality of life score and doses of OHA and insulin were recorded in all the patients in the beginning of study.

Patients in the control group (n=72) were managed on conventional medical therapy or usual unsupervised exercise protocol at home while those in the yoga group (n=82) were advised strict life style modification and yogic exercises at “Dhyan Center” of the hospitals. At the end of one month all the patients were reevaluated for the above parameters except lipid profile and glycosylated hemoglobin. Doses of OHA and insulin were titrated according the results of glycemic control every week. At the end of three months, besides above parameters the glycosylated hemoglobin and lipid profile were also estimated. Quality of life score were assessed by psychological questionnaire (10), self evaluation questionnaire (10) and diabetes quality of life questionnaire (11) in the beginning and at the end of the study in all the patients.

Yoga Lifestyle Intervention Programme

The patients were asked to come daily or at least five days a week for continuous 3 months duration.

They were put on strict diabetic diet. The yogic lifestyle intervention program consisted of-

1. Health rejuvenating exercises (5 min) – A set of movements for improving the general tone of body and to improve coordination.
2. Asanas – Yogic postures for stretch relaxation.
 - a. Surya namaskar/parmeshwar vandana (3 min)
 - b. Paschimottanasana (3 min)
 - c. Ardhamatsyasana (3 min)
 - d. Uttanpadmasana (3 min)
 - e. Sarvangasana (3 min)
 - f. Matsyasana (3 min)
3. Abdomen exercises (7 min)
4. On every alternate day either
 - a. Relaxation exercises (Kayotsarga) (30 min) – A method of complete relaxation to prepare the body and mind for meditation or

Table 1: Base line Characteristics of Control and Yoga Groups

Parameters	Group I (n=72)	Group II (n=82)	p	
Age (yrs)	49.90±10.98	53.00±7.98	< 0.10	
Sex (M/F)	24F,48 M	22 F,60 M	NS	
Diabetic duration (months)	49.90±10.99	53.00±7.98	0.10	
BMI (kg/m ²)	25.81±3.74	26.60±3.99	0.065	
W/H Ratio	0.93±0.07	0.94±0.07	NS	
Blood Pressure (mmHg)	Systolic	129.63±9.02	130.02±15.25	NS
	Diastolic	83.64±4.56	83.78±7.96	NS
Quality of life (score)	Satisfaction	64.44±7.78	61.84±6.54	NS
	Impact	62.26±7.57	61.67±6.93	NS
Worry : Diabetes related	14.36±2.22	14.48±2.16	NS	
Psychological assessment (score)	237.65±16.41	234.76±19.52	NS	
Self evaluation (score)	46.47±6.41	45.84±7.30	NS	
Glycemic control	FBS (mg/dl)	190.39±29.43	183.91±39.26	NS
	HbA _{1c} (%)	9.16±0.82	9.35±1.02	NS
Lipid Profile (mg/dl)	TC	222.60±39.12	222.27±35.09	NS
	TG	156.24±33.43	151.15±23.92	NS
	HDL	39.78±6.80	38.67±6.51	NS
	VLDL	31.25±6.79	30.23±4.78	NS
	LDL	151.57±37.31	146.80±23.26	NS
Renal Function	Microalbuminuria	54.15±28.00	61.25±33.24	NS
	B. urea mg/dl	26.44±4.34	27.63±4.64	NS
	S. Creatinine mg/dl	0.84±0.19	0.87±0.22	NS

Group I = Control Group; Group II = Study Group

- b. Preksha meditation (Preksha means seeing deeply within) including pranayama (breathing exercises) and Anupreksha (reflection on moral value for 30 min)

control, lipid profile, renal function and quality of life (Table 1).

Statistical Analysis

Quantitative data were presented as mean±SD and the Student's 't' test was used to compare the results. Qualitative variables were compared using χ^2 test. All p values were 2 tailed, p value < 0.05 was considered significant. Analyses of different parameters were done by using SPSS version 7.5 computer software.

RESULTS

Initially 200 patients were randomly selected but 28 patients in group-1 and 18 patients from group-2 (study group) were excluded from the study because of poor compliance or refusal to participate. Hence study was conducted only in 154 patients (group-1 n=72 and group-2 n=82). The demographic parameters of both groups were similar in respect to mean age, sex, weight, duration, BMI, W/H ratio, glycemic

At the end of 3 months, the yoga group showed significant improvement in glycemic control i.e. HbA_{1c} (mean change 0.79 vs 0.32%, p<0.005), Fasting blood glucose (mean change 33.25 vs 1.18 mg/dl, p<0.0001), BMI (mean change 1.38 vs 0.43m/kg² p<0.001), W/H ratio (mean change 0.05 vs 0.02 p<0.028) improvement in quality of life, satisfaction score (mean change 17.04 vs 1.46 p<0.0001) impact score (mean change 18.11 vs 2.26 p<0.0001) and worry score (mean change 3.48 vs 0.736 p<0.001), psychological assessment (mean change -28.09 vs -3.24 p<0.0005), self evaluation (mean change -10.33 vs -3.03 p<0.005). There was also improvement in lipid profile i.e. total cholesterol (mean decline 29.61 vs 10.44 mg/dl p<0.0005), triglycerides (mean decline 27.98 vs 2.06 mg/dl p<0.00001), HDL (mean increase 11.49 vs 1.89 mg/dl p<0.0001), LDL (mean change 28.90 vs 6.63 mg/dl p<0.0078) and VLDL (mean change 5.60 vs 1.64 mg/dl p<0.001) There was also an improvement in blood pressure i.e. systolic blood pressure (mean change 7.46 vs 0.92 mm of Hg

Table 2 : Parameters at Baseline and after 3 Months

Parameters	Control Group (Group I N=72)				Yoga Group (Group II N=82)				P Value*
	Base Line	After 3 Months	Change at 3 Months	P(before VS after)	Base Line	After 3 Months	Change at 3 Months	P(before VS after)	
BMI	25.81±3.74	25.39±2.99	0.43±2.04	0.08	26.60±3.99	25.22±4.03	1.38±1.04	<0.001	<0.05
W/H ratio	0.93±0.07	0.91±0.05	0.02±0.05	0.735	0.94±0.07	0.89±0.07	0.05±0.06	<0.028	<0.001
Satisfaction	66.44±7.78	62.99±4.46	1.46±7.57	0.107	61.84±6.54	44.79±6.91	17.04±7.05	<0.0001	<<0.005
Impact	62.26±7.57	60.00±3.83	2.26±7.49	0.012	61.67±6.93	43.56±6.54	18.11±7.67	<0.0001	<0.001
Worry	14.36±2.22	13.63±1.28	0.736±2.25	0.007	14.48±2.16	11.00±1.81	3.48±1.48	<0.001	<<0.005
PA	237.65±16.41	240.89±12.64	-3.24±13.28	0.05	234.76±19.52	262.84±14.19	-28.09±16.01	<0.0005	<0.0001
SE	46.47±6.41	49.50±6.86	-3.03±8.21	0.003	45.84±7.30	56.17±6.26	-10.33±7.75	<0.005	<0.001
FBS	190.39±29.43	189.21±28.46	1.18±33.50	0.766	183.91±39.26	150.66±34.21	33.25±39.28	<0.0001	<0.005
HbA _{1c}	9.16±0.82	8.84±0.98	0.32±0.97	0.007	9.35±1.02	8.56±0.95	0.79±0.54	<0.005	<0.001
TC	222.60±39.12	212.15±34.47	10.44±30.38	0.005	222.27±35.09	192.66±24.51	29.61±20.83	<0.0005	<0.0007
TG	156.24±33.93	154.18±27.70	2.06±29.22	0.552	151.15±23.92	123.17±29.31	27.98±20.53	<0.00001	<0.0008
HDL	39.78±6.80	41.67±6.58	-1.89±7.42	0.034	38.67±6.51	50.16±5.50	-11.49±4.72	<0.0001	<0.001
LDL	151.57±37.31	144.94±24.63	6.63±33.40	0.096	146.80±23.26	117.89±19.22	28.90±15.84	<0.0078	<0.006
VLDL	31.25±6.79	29.60±6.26	1.64±4.57	0.003	30.23±4.78	24.63±5.86	5.60±4.11	<0.001	<0.003
BP Systolic	129.63±9.02	128.7±8.57	0.92±4.16	0.066	130.02±15.25	122.56±6.60	7.46±10.59	<0.001	<0.002
BP Diastolic	83.64±4.56	82.86±3.40	0.78±3.76	0.084	83.78±7.96	80.10±3.51	3.68±5.092	<0.001	<0.001
Micro-									
Albuminuria	54.12±28.00	51.84±24.99	2.30±8.32	0.337	61.25±33.24	56.25±30.74	5.00±10.95	0.088	0.14
B.Urea	26.44±4.34	26.01±3.20	0.43±3.99	0.362	27.63±4.64	27.01±3.61	0.61±3.17	0.084	0.76
S.Creatinine	0.84±0.19	0.81±0.13	0.03±0.20	0.124	0.87±0.22	0.85±0.14	0.02±0.18	0.285	0.51

*Control vs Yoga group; PA – Psychological assessment, SE – Self evaluation

Table 3 Effect of Yoga on Dosage of Drugs

Drugs	Tabs Consumed per week								Insulin consumed per day							
	0 mth			3 mths			t	p	0 mth			3 mths			t	p
	Mean	SD	SE	Mean	SD	SE			Mean	SD	SE	Mean	SE	SE		
Metformin	13.7	3.77	0.75	9.24	6.62	1.32	4.226	<0.001								
Glipizide	13.0	2.65	1.00	9.00	3.42	1.29	4.828	<0.05								
Gliclazide	12.60	2.95	0.93	8.40	5.52	1.75	2.25	<0.05								
Glibenclamide	12.05	4.31	1.36	8.75	5.02	1.59	1.173	>0.05								
Acarbose	17.50	4.92	3.50	10.50	4.95	3.50	-	-								
Glipizide + metformin	17.50	4.94	3.50	14.00	9.90	7.00	1.00	>0.05								
Glipizide + Insulin	5.83	2.02	1.17	5.83	2.02	1.17	-	-	21	3.61	2.08	21.00	3.61	2.08	-	-
Glibenclamide + insulin	7.00	-	-	7	-	-	-	-	20	-	-	21.00	-	-	-	-
Metformin + Insulin	10.50	4.95	3.50	10.50	4.95	3.50	-	-	15.00	4.24	3.00	12.00	4.24	3.00	-	-
Insulin									46.20	6.00	1.90	34.20	13.01	4.11	2.758	<0.05

p<0.001), diastolic blood pressure (mean change 3.68 vs 0.78 mm of Hg p<0.001). There was no significant change in renal functions (Table-2). There was also significant reduction in doses of metformin (mean change 4.46 vs 0.54 p<0.0001), glipizide (mean change 6.0 vs 4.0 p<0.001) and insulin (mean change 12.0 vs 2.0 p<0.0005) and other drugs (Table-3).

DISCUSSION

The prevalence of diabetes is high in Indians as a whole and is rising very rapidly due to urbanization and westernization. Recent national survey showed that the prevalence of diabetes in urban adults is 12.1% (12). A number of factors are related to this phenomenal increase directly or indirectly. We have tried to identify association of life style modification with includes diet and yoga in this study, because a number of reports have shown favorable outcome on patients of coronary artery disease using this maneuvers. However there is a paucity of studies showing such a relationship in patients of diabetes and their complications.

We observed improvement in glycemic control in patients who had undertaken yogic interventions. Earlier, Sahay (1994) (13) reported significant beneficial effect of six month yoga therapy in diabetic patients. BMI decreased from 24.02 to 23.05 kg/m²; p<0.001, Fasting blood glucose decreased from 148.19±43.13 to 108.19±21.05 mg/dl; p<0.001, HbA_{1c} reduction was from 10.41% to 8.45%; p<0.01. There was also a significant decrease in FFA, LDL and VLDL

cholesterol and increase in HDL cholesterol, along with reduction in systolic blood pressure from 143.5 to 130.7 mmHg; p < 0.05 and diastolic blood pressure from 93.7 to 86.9 mmHg; p < 0.05. Manchanda et al (2000) (14) observed statistically significant improvement in lipid profile along with weight reduction – 6.8±8.2% (p=0.0019) after yogic life style intervention in coronary atherosclerotic patients.

Calle-Pascual et al (1991) (15) observed reduction in BMI from 34.2±0.8 kg/m² to 30.6±1.1 kg/m² (p < 0.05), TG level reduction from 164.5±12 to 109.7±10 mg/dl (p < 0.01) and HDL increase from 1.27±0.05 to 1.53±0.12 mg/dl (p < 0.01) after behaviour modification in obese type 2 diabetic patients.

Diabetic patients have higher level of psychological disturbances especially depression and we observed marked improvement in stress scores by psychological assessment and self evaluation scoring system. There was significant improvement in satisfaction score (p<0.0001), impact score (p<0.0001) and worry score (p<0.001). Similar results were observed by Naga et al who found significant improvement in depression by Kriya Yoga (SKY). There was also a significant improvement in lipid profile parameters.

We also observed significant reduction in doses of oral hypoglycemic agents and insulin after yoga life style intervention. Sahay et al (1994) (14) also observed reduction in drug score from 1.71 to 1.08 (p<0.001) after three month of yoga treatment and

similar results were observed by Jain et al (1993) (17).

Thus from the favourable changes observed using different parameters in this study we found that yoga life style intervention have several beneficial effects, in the form of improvement in glycemic control, reduction in body weight and favorable alteration in lipid profile parameters. There was also a favorable response on various risk factors like BMI, W/H ratio and quality of life. The present study shows that adjunctive use of yoga life style interventions significantly improves glycemic status and various risk factors. There was also a significant reduction in doses of OHA and insulin. Being a traditional and cost effective life style management maneuver it can be used as an alternative therapy in the patients of diabetes mellitus.

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